

(19)日本国特許庁(JP)

(12) 公開特許公報(A)

(11)特許出願公開番号

特開平6-250542

(43)公開日 平成6年(1994)9月9日

(51)Int.Cl.<sup>5</sup>

G 0 3 G 15/20

識別記号

1 0 2

庁内整理番号

1 0 3

F I

技術表示箇所

審査請求 未請求 請求項の数7 OL (全 10 頁)

(21)出願番号 特願平5-36454

(22)出願日 平成5年(1993)2月25日

(71)出願人 000001007

キャノン株式会社

東京都大田区下丸子3丁目30番2号

(72)発明者 遠藤 才二郎

東京都大田区下丸子3丁目30番2号キャノ  
ン株式会社内

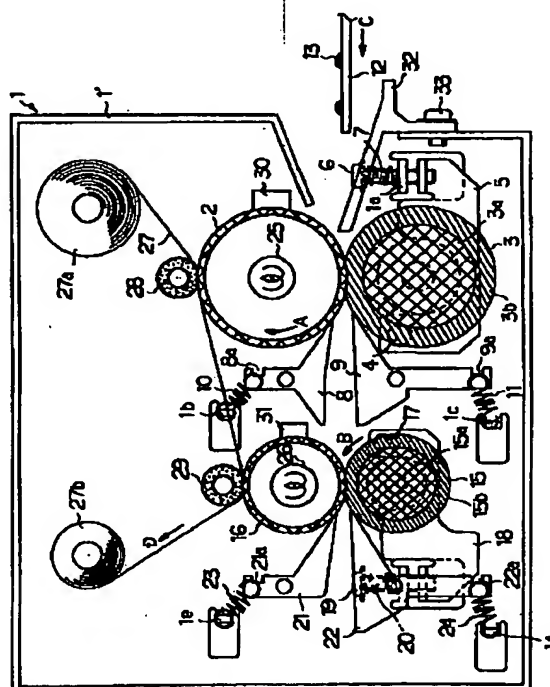
(74)代理人 弁理士 山下 充一

(54)【発明の名称】 画像形成装置

(57)【要約】

【目的】 記録材の搬送性向上を図ることができる信頼性の高い画像形成装置を提供すること(第1発明)。

【構成】 画像形成装置の定着装置1において、記録材12の進行方向に沿って定着ローラ対を2対以上配設し、該定着ローラ対の定着ローラ2、16の直径が記録材12の進行方向に沿って順次小さくなるよう構成する(第1発明)。第1発明によれば、最初の定着ローラ対(定着ローラ2を含むローラ対)で1度目の定着を受けた記録材12がカールして次の定着ローラ対(定着ローラ16を含むローラ対)を通過する際、該記録材12はカールしているにも拘らず、該記録材12はジャムしないで分離、搬送されるため、該記録材12の分離性及び搬送性が高められて画像形成装置の信頼性が高められる。



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## 【特許請求の範囲】

【請求項1】 互いに圧接して回転自在に配設した定着ローラと加圧ローラから成る定着ローラ対の間に、未定着現像剤像を担持する記録材を通して定着を行なう定着装置を備える画像形成装置において、前記記録材が進行する方向に沿って前記定着ローラ対を2対以上配設し、該定着ローラ対の定着ローラの直径が記録材の進行方向に沿って順次小さくなるよう構成したことを特徴とする画像形成装置。

【請求項2】 互いに圧接して回転自在に配設した定着ローラと加圧ローラから成る定着ローラ対の間に、未定着現像剤像を担持する記録材を通して定着を行なう定着装置を備える画像形成装置において、前記記録材が進行する方向に沿って前記定着ローラ対を2対以上配設し、該定着ローラ対の定着ローラの逆クラウン量が記録材の進行方向に沿って順次小さくなるよう構成したことを特徴とする画像形成装置。

【請求項3】 互いに圧接して回転自在に配設した定着ローラと加圧ローラから成る定着ローラ対の間に、未定着現像剤像を担持する記録材を通して定着を行なう定着装置を備える画像形成装置において、前記記録材が進行する方向に沿って前記定着ローラ対を2対以上配設し、該定着ローラ対の総加圧力が記録材の進行方向に沿って順次小さくなるよう構成したことを特徴とする画像形成装置。

【請求項4】 前記各定着ローラ対の加圧ローラは加圧手段によって定着ローラに圧接され、加圧手段の力が記録材の進行方向に沿って順次小さくなるよう構成したことを特徴とする請求項3記載の画像形成装置。

【請求項5】 前記各定着ローラ対の加圧ローラはゴムで構成され、該加圧ローラのゴムの硬度が記録材の進行方向に沿って順次小さくなるよう構成したことを特徴とする請求項3記載の画像形成装置。

【請求項6】 前記各定着ローラ対の加圧ローラはゴムで構成され、該加圧ローラのゴムの肉厚が記録材の進行方向に沿って順次大きくなるよう構成したことを特徴とする請求項3記載の画像形成装置。

【請求項7】 前記各定着ローラ対の定着ローラと加圧ローラ間に形成されるニップの幅が記録材の進行方向に沿って順次大きくなるよう構成したことを特徴とする請求項3記載の画像形成装置。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】本発明は、複写機、ファクシミリ、レーザビームプリンタ等の画像形成装置に関する。

## 【0002】

【従来の技術】従来、電子写真方式を採る画像形成装置では、未定着の現像剤の記録材への定着方式として熱定着方式が多く使われている。

【0003】ところで、近年、複写機の普及に伴ってコ

ピーの使用枚数が増加し、加えてオフィスの省力化、自動化の所謂OA（オフィスオートメーション）化の進展によって複写処理スピード（コピースピード）の速い複写機が要求されてきており、特に、コピースピード50枚/分以上の高速機、更には100枚/分以上の超高速機が普及するに至っている。

## 【0004】

【発明が解決しようとする課題】ところが、上記高速機や超高速機における熱定着器には定着性の確保が要求されるため、定着ローラはその肉厚や径が大きくなり、熱容量も大きくなり、更には、その定着ローラに十分な熱エネルギーを与えるために大きなワッテージのハロゲンヒータが必要であり、ウェイトタイムが長くなったり、装置の消費電力が大きくなる他、装置も大型化するという問題があった。

【0005】そして、画像形成装置が大型化すると、そのメンテナンスが複雑化し、更には設置スペースやメンテナンススペースの確保が困難となり、小型でメンテナンスの容易な高速機、超高速機の提案が望まれていた。

【0006】特に、ウェイトタイムはユーザーにとっては不要で無駄な時間であり、高速機や超高速機において定着性を損なうことがなく、ウェイトタイムの短縮が可能な締着装置の出現が強く望まれていた。

【0007】又、近年のOA化の進展により、複写機の機能が多機能化してきており、両面コピーや多重コピーの機能が多く使われてきている。この両面多重機能は、高速機や超高速機等には標準的に装備されており、又、コピースピードが20～40枚/分の中低速機でも標準装備若しくはオプション対応で装備されている。この両面・多重コピー動作には、記録材に画像形成させた後に中間トレイに該記録材を一旦スタックし、その記録材の裏面若しくは同一面に再度画像形成させて定着を行なう工程が含まれている。

【0008】ところで、従来の熱定着方式では、熱と加圧力によって必ず記録材にカールが発生し、その記録材のカール方向やカール量は環境や紙種或いはサイズ等でバラツキが大きく、記録材を中間トレイに収納スタックさせる際に、該記録材がカールで丸まって収納できなかったり、先端部が折れたり、搬送途中でジャムしたり、再給紙の際にカールの影響で2面目の画像形成時に再転写が発生したり、転写抜けが発生したりして画像品質が低下することがあった。

【0009】又、定着器を通過した記録材が機外に排出されて、ソーターやフィニッシャーやトレイ等に収納される際にも、カールによって該記録材の収納不良やジャム等が発生することがあった。

【0010】上述のように、両面多重機能を十分に満足させることは容易でなく、このため今までに種々のカール防止手段等が考案されているが、何れも十分とは言えず、カールの少ない信頼性の高い両面多重機能を装備し

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た装置の出現が強く望まれていた。

【0011】更に、最近では地球環境保護のエコロジーの立場から、森林資源の確保のために再生紙がコピー紙として使われ始めてきており、加えて、先の両面多重機能によって紙の表裏に画像形成が可能のためにコピー紙を極力減らすことが可能となり、再生紙を使用しての両面コピーや多重コピーが多く用いられるようになってきている。

【0012】ところが、再生紙はその紙繊維が何回かの処理工程によってダメージを受け、紙の腰（剛性）が弱くなっており、更に紙繊維のスキ目方向のバラツキ具合を示す配向角度が大きく、繊維の方向性が一樣でないため、通常のコピー紙に比べて、熱定着方式における熱と加圧力によってカール量が大きく、搬送性が著しく劣る欠点を有している。加えて、両面多重機能を装備している画像形成装置においては、先に説明したカールに起因する様々な欠点がより顕著になり、再生紙等を含めたより多くの記録材に対する信頼性のラチチュードを高めた画像形成装置の出現が強く望まれていた。

【0013】従って、第1発明の目的とする処は、記録材の搬送性向上を図ることができる信頼性の高い画像形成装置を提供することにある。

【0014】又、第2発明の目的とする処は、記録材のシワの発生防止を図り、両面多重機能を含めた信頼性を高めることができる画像形成装置を提供することにある。

【0015】更に、第3発明の目的とする処は、記録材の分離性の向上、シワの発生防止、オフセット現象の発生防止等を図ることができる信頼性の高い画像形成装置を提供することにある。

【0016】

【課題を解決するための手段】上記目的を達成すべく第1発明は、互いに圧接して回転自在に配設した定着ローラと加圧ローラから成る定着ローラ対の間に、未定着現像剤像を担持する記録材を通して定着を行なう定着装置を備える画像形成装置において、前記記録材が進行する方向に沿って前記定着ローラ対を2対以上配設し、該定着ローラ対の定着ローラの直径が記録材の進行方向に沿って順次小さくなるよう構成したことをその特徴とする。

【0017】又、第2発明は、互いに圧接して回転自在に配設した定着ローラと加圧ローラから成る定着ローラ対の間に、未定着現像剤像を担持する記録材を通して定着を行なう定着装置を備える画像形成装置において、前記記録材が進行する方向に沿って前記定着ローラ対を2対以上配設し、該定着ローラ対の定着ローラの逆クラウン量が記録材の進行方向に沿って順次小さくなるよう構成したことをその特徴とする。

【0018】更に、第3発明は、互いに圧接して回転自在に配設した定着ローラと加圧ローラから成る定着ロー

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ラ対の間に、未定着現像剤像を担持する記録材を通して定着を行なう定着装置を備える画像形成装置において、前記記録材が進行する方向に沿って前記定着ローラ対を2対以上配設し、該定着ローラ対の総加圧力が記録材の進行方向に沿って順次小さくなるよう構成したことをその特徴とする。

【0019】

【作用】一般的に熱ローラ定着方式において、定着した記録材の搬送ジャム発生の原因の1つに定着ローラの直径（曲率）が大きく関与しており、直径が大きく曲率の小さな定着ローラでは記録材の曲率分離ができにくいため、該定着ローラに記録材が巻き付く傾向となる。このため、記録材を分離爪によって分離する必要があり、従って、分離ジャムが発生し易くなる。

【0020】逆に、直径が小さく曲率の大きな定着ローラでは記録材の曲率分離ができ易いため、記録材が定着ローラに巻き付かず、該記録材の分離性が良い。

【0021】而して、第1発明によれば、定着ローラ対の定着ローラの直径が記録材の進行方向に順次小さくなる（曲率が順次大きくなる）ため、1度目の定着を受けた記録材がカールして再度定着ローラ対を通過する際、該記録材はカールしているにも拘らず、該記録材はジャムしないで分離、搬送され、該記録材の分離性及び搬送性が高められて画像形成装置の信頼性向上が図られる。

【0022】又、一般的に定着ローラは、記録材のシワ発生防止のために逆クラウン形状に成形されており、その逆クラウン量と加圧ローラによる加圧力によって記録材にストレスを生じさせて該記録材にシワが発生するのを防止している。この場合、定着ローラの逆クラウン量が大きいときには、記録材へのストレスの発生が大きくなって記録材にシワが発生しにくい。

【0023】而して、第2発明によれば、定着ローラの逆クラウン量が記録材の進行方向に沿って順次小さくなるよう構成されているため、最初の定着ローラ対で記録材に比較的大きなストレスが生じて該記録材にシワが発生するのが防がれ、特に両面多重機能を含めた画像形成装置の信頼性が高められる。

【0024】更に、一般的に加圧手段の力又は加圧ローラの硬度は定着ローラと加圧ローラの圧接力に関係しており、加圧手段の力が大きい又は加圧ローラの硬度が高いと定着ローラと加圧ローラによって生ずる加圧力も大きくなり、記録材が定着ローラと加圧ローラの間に強く挟まれることになり、通常シワ発生防止のために設けられている定着ローラの逆クラウン形状での記録材を伸ばす効果が抑制されて記録材にシワが発生し易くなる。特に、再び定着ローラ対を通過させるような両面又は多重機能動作の際には顕著である。

【0025】記録材である紙の繊維は1面目コピー時に圧力と熱によって伸び切った状態となり、2面目コピー時に再び定着ローラを通過する際に記録材を伸ばす効果

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が薄れ、1面目と同じ加圧力では記録材に必要以上の力を加えることになり、記録材にむしろ多くのシワを発生させてしまうことになる。

【0026】而して、第3発明によれば、記録材が順次進むに従って定着ローラと加圧ローラが圧接することによる総加圧力が順次小さくなるため、記録材に必要以上の力を加えないで済み、従って、該記録材のシワの発生が抑えられ、画像形成装置の搬送性及び信頼性向上が図られる。特に、両面多重機能を含めた装置全体の大幅な信頼性向上が図られる。

【0027】又、最初の定着ローラ対では総加圧力が大きいため、記録材上の現像剤に十分な圧力が与えられて高い定着性が得られ、定着性が低い時に発生するようなオフセット現象は起きず、定着ローラへの現像剤の付着がなく、その結果として、記録材と定着ローラとの分離性が良くなる。

【0028】つまり、最初の定着ローラ対において、オフセット現象を著しく発生させない程度の総加圧力を付与しておけば、次の定着ローラ対の総加圧力が小さくても、最初の定着ローラ対で高い定着性を確保することができ、オフセット現象の発生を防止し、且つ、定着性も確保し、安定した高画質が得られるとともに、定着ローラのクリーニング手段の高寿命化及びサービスマンテナンスの容易化も可能となる。

【0029】

【実施例】

【第1発明】以下に第1発明の実施例を添付図面に基づいて説明する。

【0030】図1は本発明に係る画像形成装置の定着装置1の断面図であり、該定着装置1は、図示矢印A方向に回転する定着ローラ2と、該定着ローラ2とのニップを形成するように圧接して配設された加圧ローラ3を有している。尚、定着ローラ2は、不図示の軸受で回転自在に支持されている。

【0031】上記定着ローラ2は、アルミニウムや鉄系の金属材料で構成されており、その芯金の肉厚は $t_1$ 、外径は $\phi D_1$ にそれぞれ設定されている。そして、該定着ローラ2の表面は、トナーの付着を防止するために、テフロン（登録商標）等のフッ素系樹脂でコーティングされている。

【0032】一方、前記加圧ローラ3は、芯金部3aとゴム部3bとで構成されており、その外径は $\phi D_1$ で、ゴム部3bの厚さは $t_1$ 、硬度は $H_{s1}$ にそれぞれ設定されている。そして、この加圧ローラ3は、回転軸4を中心として回転する加圧アーム5に不図示の軸受を介して回転自在に支持されており、該加圧アーム5の他端は、ネジ6に係合し、定着装置1の枠体1'の一部に形成された突起1aとバネ力 $p_1$ を有した加圧バネ7によって付勢されている。従って、加圧ローラ3には総加圧力 $P_1$ が付与され、該加圧ローラ3は定着ローラ2に圧

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接して定着ローラ2との間に幅 $T_1$ のニップを形成している。

【0033】又、定着ローラ2と加圧ローラ3には、それぞれ分離爪8、9が設けられており、これらの分離爪8、9の各一端8a、9aにはバネ10、11がそれぞれ係合しており、各バネ10、11の他端は定着装置1内の固定端1b、1cに係合しており、これによって分離爪8、9が定着ローラ2と加圧ローラ3にそれぞれ所定圧で当接している。

【0034】而して、該定着装置1においては、図1の右側より紙12が不図示の搬送部によって左側へ搬送されて来る。尚、紙12上には未定着現像剤像13が形成されている。

【0035】そして、定着装置1には上記紙12の搬送方向に沿って左側に加圧ローラ15と定着ローラ16が配設されている。加圧ローラ15は図示矢印B方向に回転駆動され、該加圧ローラ15に定着ローラ16が圧接して両者間にニップが形成されている。ここで、定着ローラ16は、不図示の軸受によって回転自在に支持されている。

【0036】上記加圧ローラ15は、円筒状の芯金部15aとゴム部15bとで構成されており、その外径は $\phi D_2$ 、ゴム部15bの厚さは $t_2$ 、ゴム硬度は $H_{s2}$ にそれぞれ設定されている。そして、この加圧ローラ15は、回転軸17を中心として回転する加圧アーム18に不図示の軸受を介して回転自在に支持されており、該加圧アーム18の他端はネジ19に係合し、定着装置1の枠体1'一部の突起1dとバネ力 $p_2$ を有した加圧バネ20によって付勢されている。従って、加圧ローラ15には総加圧力 $P_2$ が付与され、該加圧ローラ15は定着ローラ16に圧接して定着ローラ16との間に幅 $T_2$ のニップを形成している。

【0037】一方、定着ローラ16は、前記定着ローラ2と同様に構成されており、アルミニウムや鉄系の金属材料で構成され、その芯金の肉厚は $t_2$ 、外径は $\phi D_2$ に設定されている。

【0038】又、加圧ローラ15と定着ローラ16には、それぞれ分離爪21、22が設けられており、分離爪21、22の各一端21a、22aにはバネ23、24がそれぞれ係合しており、それぞれのバネ23、24の他端は定着装置1内の固定端1e、1fに係合しており、これによって各分離爪21、22は加圧ローラ15、定着ローラ16にそれぞれ所定圧で当接している。

【0039】更に、定着ローラ2と定着ローラ16の内部には、その長手方向に延びるハロゲンヒータ25、26がそれぞれ配設されており、ハロゲンヒータ25、26はそれぞれ $W_1$ 、 $W_2$ のワットテージを有しており、それらで発生する熱が定着ローラ2、16を介して、図示矢印C方向に進行して来る紙12上の未定着現像剤像13に作用し、現像剤像13が紙12上に定着される。

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【0040】又、定着ローラ2及び定着ローラ16には、所定量のオイルを含油したウェブ27がウェブローラ28、29を介して当接しており、定着ローラ2、16の表面上の残留現像剤はウェブ27によって除去される。ウェブ27は、供給側27aより定量的に送り出され、巻き取り側27bにより図示D矢印方向へ巻き取られ、該ウェブ27によってオフセットの発生が防がれる。

【0041】更に、ハロゲンヒータ25、26が設けられている定着ローラ2と定着ローラ16には、それぞれの表面上の温度を制御するために、温度検知器であるサーミスタ30、31が定着ローラ2、16に所定圧で当接せしめられている。

【0042】一方、定着装置1の枠体1'には、紙12を定着ローラ2側へ案内搬送するための入口ガイド32がビス33で取り付けられており、紙12を定着ローラ2の側へ当接、進入させることで右側の定着ローラ対（定着ローラ2と加圧ローラ3）による紙12のシワの発生を防いでいる。

【0043】ところで、本実施例に係る定着装置1においては、定着ローラ2と加圧ローラ3で構成される定着ローラ対と加圧ローラ15と定着ローラ16で構成される定着ローラ対の計2対の定着ローラ対が配設されているが、各定着ローラ対の定着ローラ2、16の直径 $\phi D_1$ 、 $\phi D_2$ は紙12の搬送方向（図1の左方向）に沿って小さくなる（ $\phi D_2 < \phi D_1$ ）ように構成されている。具体的には、定着ローラ2、16の直径 $\phi D_1$ 、 $\phi D_2$ は、それぞれ $\phi D_1 = \phi 4.0\text{mm}$ 、 $\phi D_2 = \phi 3.0\text{mm}$ に設定されている。

【0044】一般的に熱ローラ定着方式において、定着した記録材の搬送ジャム発生の原因の1つに定着ローラの直径（曲率）が大きく関与しており、直径が大きく曲率の小さな定着ローラでは記録材の曲率分離ができにくいため、該定着ローラに記録材が巻き付く傾向となる。このため、記録材を分離爪によって分離する必要があり、従って、分離ジャムが発生し易くなる。

【0045】逆に、直径が小さく曲率の大きな定着ローラでは記録材の曲率分離ができ易いため、記録材が定着ローラに巻き付かず、該記録材の分離性が良い。

【0046】而して、本実施例によれば、定着ローラ対の定着ローラ2、16の直径 $\phi D_1$ 、 $\phi D_2$ が紙12の搬送方向（図1の左方向）に沿って小さくなる（ $\phi D_2 < \phi D_1$ ）ように構成されているため、定着ローラ2と加圧ローラ3によって1度目の定着を受けた紙12がカールして次に加圧ローラ15と定着ローラ16の間を通過する際、該紙12はカールしているにも拘らず、この紙12はジャムしないで分離、搬送され、該紙12の分離性及び搬送性が高められて画像形成装置の信頼性向上が図られる。

【0047】又、定着装置1の枠体1'内に一体的に

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2対の定着ローラ対がコンパクトに配設され、しかも各定着ローラ対は従来よりも小径の定着ローラ2、16で構成されるため、定着装置1の小型化、延いては画像形成装置の小型化、メンテナンスの容易化等が実現できる。

【0048】ここで、定着装置1を備える画像形成装置を図2に基づいて説明する。尚、図2は画像形成装置要部の構成図である。

【0049】図2において、100は矢印J方向に回転する円筒状の潜像担持体である感光ドラムであり、該感光ドラム100の上方には一次帯電器101が配設されている。

【0050】而して、感光ドラム100の表面は一次帯電器101によって一様に帯電され、該表面は露光ビーム102によって露光され、感光ドラム100の表面上には静電潜像が形成される。そして、この静電潜像は、感光ドラム100の回転方向に順次配設された現像装置103、104の何れか又は双方によってトナー像として現像される。尚、一方の現像装置103には非磁性の有彩色トナーが収納されており、他方の現像装置104には磁性の黒色トナーが収納されているため、多色のコピーが可能である。

【0051】上記トナー像は、感光ドラム100の回転に伴って該感光ドラム100の下方の転写帯電器105が配された転写部に到来する。転写部には、カセットC1、C2の何れかから選択的に取り出された記録材12が搬送路106を通過して進行し、該記録材12はレジストローラ対107によって制御されて感光ドラム100上のトナー像とタイミングを合せて搬送され、該記録材12上には転写帯電器105によってトナー像が転写される。

【0052】次に、前記転写帯電器105と並んで配設された分離帯電器108によって、転写時に記録材12に付与された電荷が除電されて記録材12は感光ドラム100から分離し、定着装置1に搬送されてここでトナー像の定着を受ける。

【0053】以上のような本画像形成装置において片面コピーを行なう場合には、図2に実線で示す位置にフラップF1を設定して記録材12をそのまま矢印E方向に搬送して機外に排出すれば良い。

【0054】一方、両面或いは多重コピーを実行する際には、フラップF1を図2に二点鎖線で示す位置に設定し、定着装置1から出た記録材12を矢印G方向に搬送する。そして、両面コピーの場合は更にフラップF2を図2に実線で示す位置に設定して該記録材12を中間トレイ111に一旦収納した後、該中間トレイ111から記録材12を取り出してこれを矢印Hに沿って搬送し、該記録材12をその第二面が感光ドラム100に対向するような向きにして搬送路106に再度供給する。このときまでに感光ドラム100に形成されているトナ

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一像を前記と同様の手法で記録材12上に転写し、この記録材12が定着装置1を通過するまでにフラップF1を図2に実線で示す位置に切り換え、定着の終了した記録材12を図示矢印E方向に搬送して機外に排出する。

【0055】又、記録材12の片面に多重コピーを行な場合には、フラップF2を図2に二点鎖線で示す位置に設定し、第一面コピー終了後に矢印G方向に進行する記録材12をそのまま図示矢印H方向に進行させてこれを搬送路106に供給し、前記と同様に2回目以降の画像形成動作を実行すれば良い。

【第2発明】以下に第2発明の実施例を添付図面に基づいて説明する。

【0056】図3は第2発明に係る定着装置1の断面図であり、該定着装置1は図1に示した第1発明に係る定着装置1と基本的に同様の構成を有する。従って、ここでは第1発明に係る定着装置1（図1参照）と異なる点のみについて述べる。

【0057】本実施例では、図4に示すように、定着ローラ2と定着ローラ16は逆クラウン形状に成形されており、一方の定着ローラ2の両端部の外径 $\phi D_{1b}$ は $\phi 40$ mmに設定されており、該両端部の外径 $\phi D_{1b}$ と中央部の外径 $\phi D_{1a}$ との差を該定着ローラ2の逆クラウン量 $a_1$ と定義すると、 $a_1 = \phi D_{1b} - \phi D_{1a} = 170\mu$ となっている。

【0058】又、他方の定着ローラ16の両端部の外径 $\phi D_{1b}$ は $\phi 40$ mmに設定され、該両端部の外径 $\phi D_{1b}$ と中央部の外径 $\phi D_{2a}$ との差を該定着ローラ16の逆クラウン量 $a_2$ と定義すると、 $a_2 = \phi D_{1b} - \phi D_{2a} = 125\mu$ となっている。

【0059】従って、本実施例では、定着ローラ2、16の逆クラウン量 $a_1$ 、 $a_2$ が記録材12の進行方向に沿って小さくなる（ $a_2 < a_1$ ）よう構成されている。このため、定着ローラ2と加圧ローラ3で構成される最初の定着ローラ対で記録材12に比較的大きなストレスが生じて該記録材12にシワが発生するのが防がれ、特に両面多重機能を含めた画像形成装置の信頼性が高められる。

【第3発明】以下に第3発明の実施例を添付図面に基づいて説明する。

【0060】＜第1実施例＞本実施例に係る画像形成装置は前記第2発明の実施例と基本的に同様の構成を有する定着装置を備えており、従って、ここでは第2発明の実施例に係る定着装置1（図3参照）と異なる点のみについて述べる。

【0061】本実施例では、定着ローラ2側の総加圧力 $P_1$ は、加圧バネ7のバネ力 $p_1$ によって決定されていて $P_1 = p_1 = 30\text{Kg}$ に設定され、定着ローラ16側の総加圧力 $P_2$ は、加圧バネ20のバネ力 $p_2$ によって決定されていて $P_2 = p_2 = 20\text{Kg}$ に設定されている。

【0062】従って、本実施例では、定着ローラ対の総加圧力が記録材の進行方向に沿って順次小さくなるよう構成されており、定着ローラ16側の総加圧力 $P_2$ が定着ローラ2側の総加圧力 $P_1$ よりも小さく（ $P_2 < P_1$ ）設定されている。

【0063】ところで、一般的に加圧手段の力又は加圧ローラの硬度は定着ローラと加圧ローラの圧接力に関係しており、加圧手段の力が大きい又は加圧ローラの硬度が高いと定着ローラと加圧ローラによって生ずる加圧力も大きくなり、記録材が定着ローラと加圧ローラの間に強く狭まれることになり、通常シワ発生防止のために設けられている定着ローラの逆クラウン形状での記録材を伸ばす効果が抑制されて記録材にシワが発生し易くなる。特に、再び定着ローラ対を通過させるような両面又は多重機能動作の際には顕著である。

【0064】記録材である紙の繊維は1面目コピー時に圧力と熱によって伸び切った状態となり、2面目コピー時に再び定着ローラを通過する際に記録材を伸ばす効果が薄れ、1面目と同じ加圧力では記録材に必要以上の力を加えることになり、記録材にむしろ多くのシワを発生させてしまうことになる。

【0065】而して、本実施例によれば、記録材が順次進むに従って総加圧力 $P_1$ 、 $P_2$ が順次小さくなる（ $P_1 > P_2$ ）ため、記録材に必要以上の力を加えないで済み、従って、該記録材のシワの発生が抑えられ、画像形成装置の搬送性及び信頼性向上が図られる。特に、両面多重機能を含めた装置全体の大幅な信頼性向上が図られる。

【0066】又、定着ローラ2側の最初の定着ローラ対では総加圧力 $P_1$ が大きいため、記録材上の現像剤に十分な圧力が与えられて高い定着性が得られ、定着性が低い時に発生するようなオフセット現象は起きず、定着ローラ2への現像剤の付着がなく、その結果として、記録材と定着ローラ2との分離性が良くなる。

【0067】つまり、最初の定着ローラ対において、オフセット現象を著しく発生させない程度の総加圧力 $P_1$ を付与しておけば、次の定着ローラ対の総加圧力 $P_2$ が小さくても、最初の定着ローラ対で高い定着性を確保することができるため、オフセット現象の発生を防止し、且つ、定着性も確保し、安定した高画質が得られるとともに、定着ローラ2、16のクリーニング手段の高寿命化及びサービスマンテナンスの容易化も可能となる。

【0068】＜第2実施例＞本実施例では、加圧ローラ3、15のゴム部3b、15bの硬度 $H_{s1}$ 、 $H_{s2}$ のみ異なり、その他は前記第1実施例と同一である。

【0069】一般的に、ゴム硬度の大きさに比例して総加圧力も大きくなることが知られている。

【0070】本実施例では、定着ローラ2側の定着ローラ対での総加圧力 $P_1$ は加圧ローラ3のゴム部3bの硬度 $H_{s1}$ によって決定されていて $H_{s1} = 50^\circ$ であり、定



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着ローラ16側の定着ローラ対の総加圧 $P_2$ は、加圧ローラ15のゴム部15bの硬度 $H_{s2} = 40^\circ$  ( $< H_{s1}$ )であるため、前記第1実施例と同様に、定着ローラ16側の総加圧力 $P_2$ が定着ローラ2側の総加圧力 $P_1$ よりも小さく ( $P_2 < P_1$ ) 設定されている。

【0071】<第3実施例>本発明の第3実施例を図5に基づいて説明する。

【0072】本実施例では、図5に示すように、加圧ローラ3と加圧ローラ15の各ゴム部3b、15bの肉厚 $t_1'$ 、 $t_2'$ のみ異なり、その他は第1実施例と同一である。

【0073】一般的に、ゴムの肉厚の大きさに比例して見掛けのゴム硬度は小さくなり、結果として総加圧力も小さくなることが知られている。

【0074】本実施例では、定着ローラ2側の定着ローラ対での総加圧力 $P_1$ は加圧ローラ3の見掛けのゴム硬度、つまり、ゴム部3bの肉厚 $t_1'$ によって決定されていて $t_1' = 5\text{mm}$ に設定され、定着ローラ16側の定着ローラ対での総加圧力 $P_2$ は加圧ローラ15の見掛けのゴム硬度、つまり、ゴム部15bの肉厚 $t_2'$ によって決定されていて $t_2' = 7\text{mm}$  ( $> t_1'$ ) に設定されているため、前記第1実施例と同様に、定着ローラ16側の総加圧力 $P_2$ が定着ローラ2側の総加圧力 $P_1$ よりも小さく ( $P_2 < P_1$ ) 設定されている。

【0075】<第4実施例>本発明の第4実施例を図6に基づいて説明する。

【0076】本実施例では、定着ローラ2と加圧ローラ3及び定着ローラ16と加圧ローラ15との圧接によって生ずるニップの幅 $T_1$ 、 $T_2$ のみ異なり、その他は第1実施例と同一である。

【0077】一般的にニップ幅が小さいと、これに比例して総加圧力も小さくなることが知られている。

【0078】本実施例では、定着ローラ2側の定着ローラ対での総加圧力 $P_1$ はニップ幅 $T_1$ で決定されていて $T_1 = 3\text{mm}$ に設定されており、定着ローラ16側の定着ローラ対での総加圧力 $P_2$ はニップ幅 $T_2$ で決定されていて $T_2 = 5\text{mm}$  ( $> T_1$ ) に設定されているため、前記第1実施例と同様に、定着ローラ16側の総加圧力 $P_2$ が定着ローラ2側の総加圧力 $P_1$ よりも小さく ( $P_2 < P_1$ ) 設定されている。

【0079】

【発明の効果】以上の説明で明らかな如く、第1発明によれば、定着ローラ対の定着ローラの直径が記録材の進行方向に順次小さくなる (曲率が順次大きくなる) ため、1度目の定着を受けた記録材がカールして再度定着ローラ対を通過する際、該記録材はカールしているにも拘らず、該記録材はジャムしないで分離、搬送され、該記録材の分離性及び搬送性が高められて画像形成装置の信頼性向上が図られるという効果が得られる。

【0080】又、第2発明によれば、定着ローラの逆クラウン量が記録材の進行方向に沿って順次小さくなるよう構成されているため、最初の定着ローラ対で記録材に比較的大きなストレスが生じて該記録材にシワが発生するのが防がれ、特に両面多重機能を含めた画像形成装置の信頼性が高められるという効果が得られる。

【0081】更に、第3発明によれば、記録材が順次進むに従って定着ローラと加圧ローラが圧接することによる総加圧力が順次小さくなるため、記録材に必要以上の力を加えないで済み、従って、該記録材のシワの発生が抑えられ、画像形成装置の搬送性及び信頼性向上が図られるという効果が得られる。

【図面の簡単な説明】

【図1】第1発明に係る画像形成装置の定着装置の断面図である。

【図2】第1発明に係る画像形成装置の構成図である。

【図3】第2発明に係る画像形成装置の定着装置の断面図である。

【図4】第2発明に係る定着ローラの逆クラウン形状を示す平断面図である。

【図5】第3発明の第3実施例を示す定着装置の断面図である。

【図6】第3発明の第4実施例を示す定着装置の断面図である。

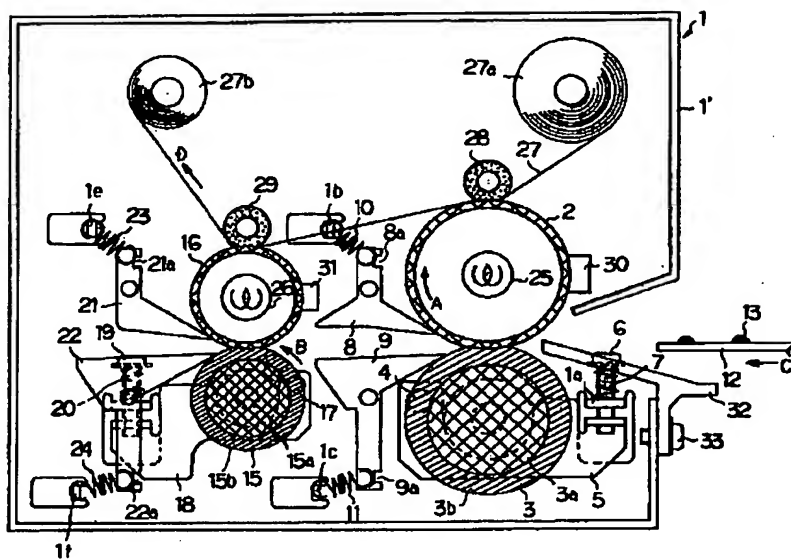
【符号の説明】

- |       |             |
|-------|-------------|
| 1     | 定着装置        |
| 2, 16 | 定着ローラ       |
| 3, 15 | 加圧ローラ       |
| 12    | 紙 (記録材)     |
| 7, 20 | 加圧バネ (加圧手段) |

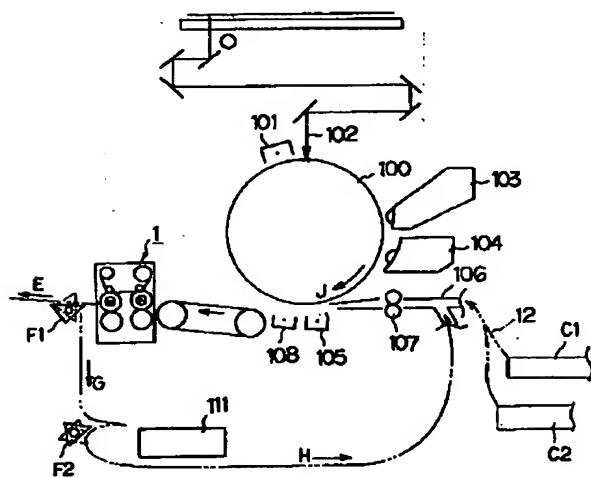
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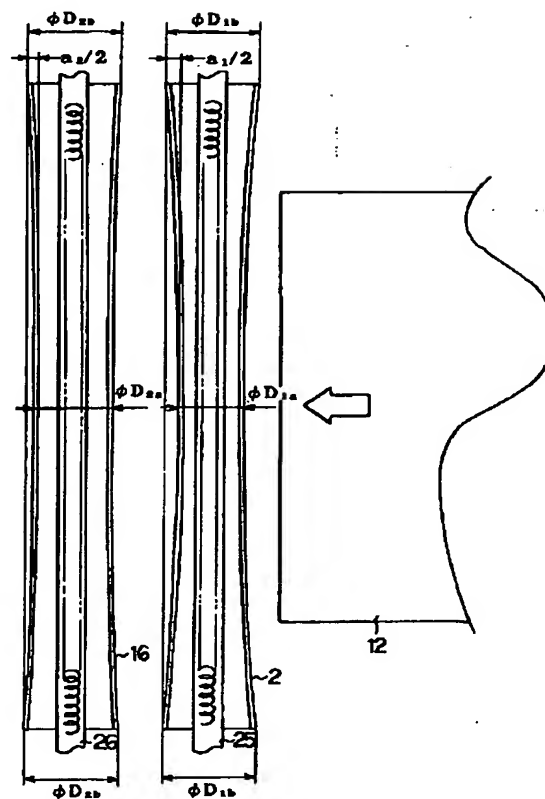
【図 1】



【図 2】



【図 4】

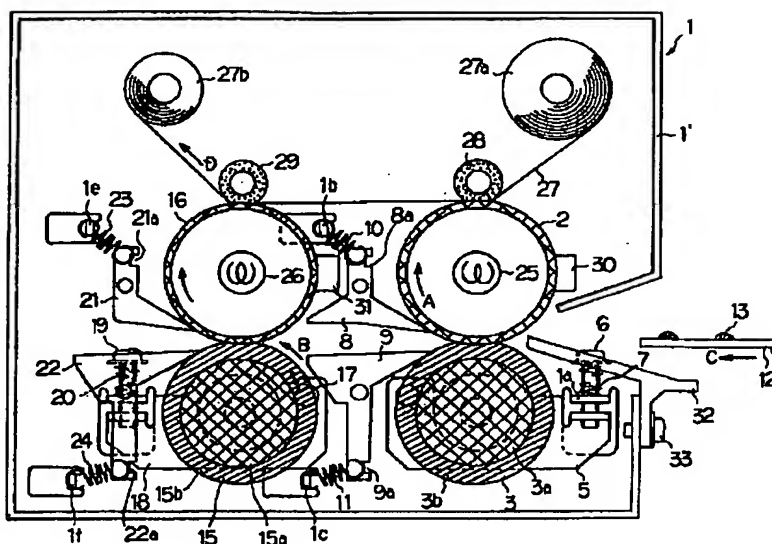




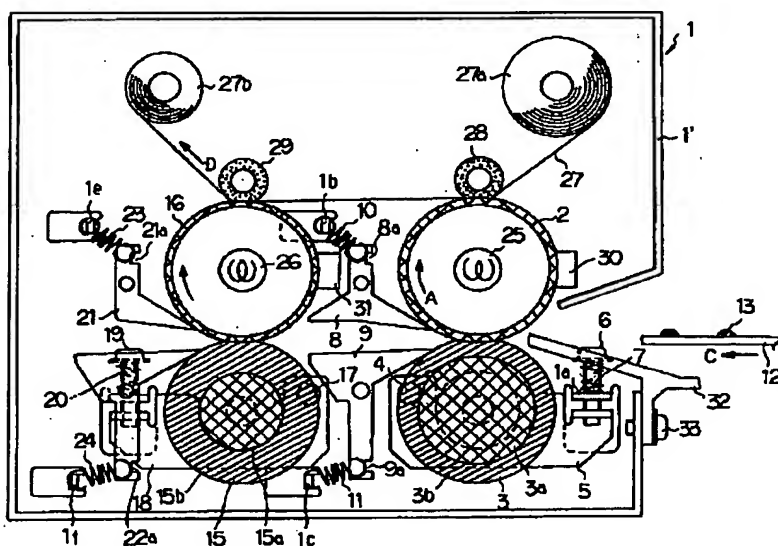
( 9 )

特開平 6 - 2 5 0 5 4 2

【図 3】



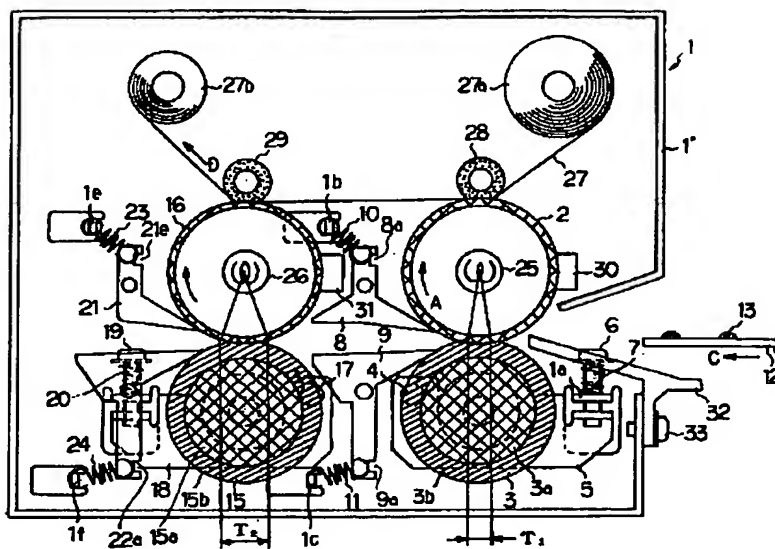
【図 5】



( 10 )

特開平 6 - 2 5 0 5 4 2

【図 6】



**IMAGE FORMING DEVICE**

Patent Number: JP6250542  
Publication date: 1994-09-09  
Inventor(s): ENDO SAIJIRO  
Applicant(s): CANON INC  
Requested Patent: ☐ JP6250542  
Application Number: JP19930036454 19930225  
Priority Number(s):  
IPC Classification: G03G15/20  
EC Classification:  
Equivalents:

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**Abstract**

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**PURPOSE:**To provide a highly reliable image forming device capable of improving the carrying property of a recording material.

**CONSTITUTION:**In a fixing device 1, two or more fixing roller pairs are arranged along the advancing direction of a recording material 12, and the diameters of fixing rollers 2, 16 of the fixing roller pairs are set to be successively reduced along the advancing direction of the recording material 12. Thus, when the recording material 12 receiving the first fixation by the first fixing roller pair (the roller pair including the fixing roller 2) is curled, and then passed through the following fixing roller pair (the roller pair including the fixing roller 16), the recording material 12 is separated and carried without jamming in spite of its curling, so that the separating property and carrying property of the recording material 12 are enhanced to enhance the reliability of an image forming device.

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**CLAIMS**


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**[Claim(s)]**

[Claim 1] The image-formation equipment characterized by to constitute so that two or more pairs of said fixing roller pair arrange along the direction where said record material advances in image-formation equipment equipped with the anchorage device established through the record material which supports a non-established developer image between the fixing roller pairs which consist of the fixing roller which carried out the pressure welding, and which was arranged free [ rotation ], and a pressurization roller and the diameter of the fixing roller of this fixing roller pair may become small one by one along the travelling direction of record material.

[Claim 2] Between the fixing roller pairs which consist of the fixing roller which carried out the pressure welding, and which was arranged free [ rotation ], and a pressurization roller In image formation equipment equipped with the anchorage device established through the record material which supports a non-established developer image Image formation equipment characterized by constituting so that two or more pairs of said fixing roller pair may be arranged along the direction where said record material advances and the amount of reverse crown of the fixing roller of this fixing roller pair may become small one by one along the travelling direction of record material.

[Claim 3] The image-formation equipment characterized by to constitute so that two or more pairs of said fixing roller pair arrange along the direction where said record material advances in image-formation equipment equipped with the anchorage device established through the record material which supports a non-established developer image between the fixing roller pairs which consist of the fixing roller which carried out the pressure welding, and which was arranged free [ rotation ], and a pressurization roller and the total welding pressure of this fixing roller pair may become small one by one along the travelling direction of record material.

[Claim 4] The pressurization roller of each said fixing roller pair is image formation equipment according to claim 3 which a pressure welding is carried out to a fixing roller with a pressurization means, and is characterized by constituting so that the force of a pressurization means may become small one by one along the travelling direction of record material.

[Claim 5] The pressurization roller of each said fixing roller pair is image formation equipment according to claim 3 characterized by having consisted of rubber, and constituting so that the degree of hardness of the rubber of this pressurization roller may become small one by one along the travelling direction of record material.

[Claim 6] The pressurization roller of each said fixing roller pair is image formation equipment according to claim 3 characterized by having consisted of rubber, and constituting so that the thickness of the rubber of this pressurization roller may become large one by one along the travelling direction of record material.

[Claim 7] Image formation equipment according to claim 3 characterized by constituting so that the width of face of the nip formed between the fixing roller of each said fixing roller pair and a pressurization roller may become large one by one along the travelling direction of record material.

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[Translation done.]

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## DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to image formation equipments, such as a copying machine, facsimile, and a laser beam printer.

[0002]

[Description of the Prior Art] Conventionally, with the image formation equipment which takes an electrophotography method, many heat fixing methods are used as a fixing method to the record material of a non-established developer.

[0003] The use number of sheets of a copy increases with the spread of copying machines, in addition, the copying machine with a quick copy process speed (copy speed) is required by the so-called progress of office laborsaving and OA(office automation)-izing of automation, and the above ultra high-speed machine has come [ by the way, / in recent years ] to spread by above high-speed machine and 100 more sheet/by copy-speed 50 sheet/especially.

[0004]

[Problem(s) to be Solved by the Invention] However, in order for the thickness and path to become large since fixable reservation is required of the heat fixing assembly in the above-mentioned high-speed machine or a ultra high-speed machine, and for heat capacity to also become large and to give still more sufficient heat energy for the fixing roller, the halogen heater of big WATTEJI was required for the fixing roller, wait time became long, the power consumption of equipment became large, and also it had the problem of also enlarging equipment.

[0005] And when image formation equipment was enlarged, the maintenance was complicated, it became still more difficult to secure [ of an installation tooth space or a maintenance tooth space ], it was small and a proposal of the easy high-speed machine of a maintenance and a ultra high-speed machine was desired.

[0006] Wait time is unnecessary and useless time amount especially for a user, and did not spoil fixable in the high-speed machine or the ultra high-speed machine, and an appearance of the secure-closing equipment which can shorten wait time was desired strongly.

[0007] Moreover, the function of a copying machine has multi-functionalized and many functions of a double-sided copy or a multiplex copy have been used by progress of automation in recent years. The high-speed machine and the ultra high-speed machine are standardly equipped with this double-sided multiplex function, and while a copy speed is a part for 20-40-sheet/, it is equipped by a standard equipment or option correspondence also with the low-speed machine. After carrying out image formation to record material, the stack of this record material is once carried out to Trey Nakama, and the process fixed to the rear face or the same field of that record material by carrying out image formation again is included in this both sides and multiplex copy actuation.

[0008] By the way, by the conventional heat fixing method, curl surely occurs in record material with heat and welding pressure. The curl direction and the amount of curl of the record material have large variation in an environment, a paper type or size, etc. In case Trey Nakama is made to do the receipt

stack of the record material, this record material can be round by curl, and cannot contain, or It was in the middle of conveyance, and the jam might be carried out, the re-imprint might occur under the effect of curl in the case of re-feeding at the time of the image formation of the 2nd side, or the imprint omission might occur [, and ], and image quality might deteriorate. [ that a point breaks ]

[0009] Moreover, also when the record material which passed the fixing assembly was discharged outside the plane and contained by a sorter, a finisher, the tray, etc., poor receipt, a jam, etc. of this record material might be generated by curl.

[0010] As mentioned above, it was not easy to fully satisfy a double-sided multiplex function, for this reason, the curl prevention means of former versatility etc. was devised, but it could not say that all were enough but an appearance of the equipment which equipped the double-sided multiplex function that dependability with little curl is high was desired strongly.

[0011] Furthermore, recently, it becomes possible from the position of the ecology of earth environmental protection to begin to use recycled paper as copy paper for reservation of forest resources, in addition to reduce copy paper as much as possible on the front reverse side of paper, by the previous double-sided multiplex function, since image formation is possible, and many the double-sided copies and multiplex copies which use recycled paper are used increasingly.

[0012] however , it have the fault which be large by heat [ in / since the directivity of fiber be uniform / the usual copy paper / whenever / orientation angle / which , as for a recycled paper , the paper fiber receive a damage by that down stream processing how many times , and the waist ( rigidity ) of paper be weak , and show the variation condition in the direction of the clearance eye of paper fiber further / be large , and / a heat fixing method ] , and welding pressure , and be remarkably inferior in conveyance nature . [ of the amount of curl ] In addition, in the image formation equipment which has equipped the double-sided multiplex function, various faults resulting from the curl explained previously became more remarkable, and an appearance of the image formation equipment which raised the latitude of the dependability over the record material of many reliance including recycled paper etc. was desired strongly.

[0013] Therefore, the place made into the purpose of the 1st invention is to offer image formation equipment with the high dependability which can plan the conveyance disposition top of record material.

[0014] Moreover, the place made into the purpose of the 2nd invention aims at generating prevention of Siwa of record material, and is to offer the image formation equipment which can raise dependability including a double-sided multiplex function.

[0015] Furthermore, the place made into the purpose of the 3rd invention is to offer image formation equipment with the high dependability which can aim at improvement in the separability of record material, generating prevention of Siwa, generating prevention of an offset phenomenon, etc.

[0016]

[Means for Solving the Problem] Between the fixing roller pairs which consist of the fixing roller which carried out the pressure welding of the 1st invention mutually, and was arranged free [ rotation ] that the above-mentioned purpose should be attained, and a pressurization roller In image formation equipment equipped with the anchorage device established through the record material which supports a non-established developer image Two or more pairs of said fixing roller pair are arranged along the direction where said record material advances, and it is characterized [ the ] by constituting so that the diameter of the fixing roller of this fixing roller pair may become small one by one along the travelling direction of record material.

[0017] Moreover, between the fixing roller pairs which consist of the fixing roller which carried out the pressure welding of the 2nd invention mutually, and was arranged free [ rotation ], and a pressurization roller In image formation equipment equipped with the anchorage device established through the record material which supports a non-established developer image Two or more pairs of said fixing roller pair are arranged along the direction where said record material advances, and it is characterized [ the ] by constituting so that the amount of reverse crown of the fixing roller of this fixing roller pair may become small one by one along the travelling direction of record material.



[0018] Furthermore, between the fixing roller pairs which consist of the fixing roller which carried out the pressure welding of the 3rd invention mutually, and was arranged free [ rotation ], and a pressurization roller In image formation equipment equipped with the anchorage device established through the record material which supports a non-established developer image Two or more pairs of said fixing roller pair are arranged along the direction where said record material advances, and it is characterized [ the ] by constituting so that the total welding pressure of this fixing roller pair may become small one by one along the travelling direction of record material.

[0019]

[Function] Generally, the diameter (curvature) of a fixing roller is participating in one of the causes of conveyance jam generating of the record material established in the heat roller fixing method greatly, and with a fixing roller with small curvature with a large diameter, since curvature separation of record material cannot be performed easily, it becomes the inclination for record material to coil around this fixing roller. For this reason, a separation pawl needs to separate record material, therefore it becomes easy to generate a separation jam.

[0020] On the contrary, since it can tend to perform curvature separation of record material in a fixing roller with big curvature with a small diameter, record material does not coil around a fixing roller, but the separability of this record material is good.

[0021] Since it \*\*, and the diameter of the fixing roller of a fixing roller pair becomes small one by one in the travelling direction of record material according to the 1st invention (curvature becomes large one by one), Although this record material has curled in case the record material which received fixing of the 1st time curls and a fixing roller pair is passed again, it dissociates and this record material is conveyed without carrying out a jam, the separability and conveyance nature of this record material are raised, and improvement in dependability of image formation equipment is achieved.

[0022] Moreover, generally, the fixing roller is fabricated by the reverse crown configuration for Siwa generating prevention of record material, and has prevented that make record material produce stress and Siwa occurs in this record material with the amount of reverse crown, and welding pressure with a pressurization roller. In this case, when the amount of reverse crown of a fixing roller is large, generating of the stress to record material becomes large, and it is hard to generate Siwa in record material.

[0023] It \*\*, and since according to the 2nd invention it is constituted so that the amount of reverse crown of a fixing roller may become small one by one along the travelling direction of record material, the dependability of the image formation equipment with which it prevented comparatively big stress's arising in record material in the first fixing roller pair, and Siwa occurring in this record material, and it included especially the double-sided multiplex function is raised.

[0024] Furthermore, generally the force of a pressurization means or the degree of hardness of a pressurization roller is related to the contact pressure of a fixing roller and a pressurization roller. The welding pressure which will be produced with a fixing roller and a pressurization roller if the degree of hardness of a pressurization roller is high or the force of a pressurization means is large also becomes large. record material should narrow strongly between a fixing roller and a pressurization roller -- it becomes \*\*\*\*\*, the effectiveness which lengthens the record material in the reverse crown configuration of a fixing roller usually established for Siwa generating prevention is controlled, and it becomes easy to generate Siwa in record material. In the case of both sides which pass a fixing roller pair again especially, or multiplex functional actuation, it is remarkable.

[0025] It will be in the condition of having been extended with a pressure and heat at the time of the copy of the 1st side, in case a fixing roller is again passed at the time of the copy of the 2nd side, the effectiveness which lengthens record material fades, and the fiber of the paper which is record material will apply the force beyond the need to record material, and makes record material generate many Siwa rather in the same welding pressure as 1 side.

[0026] Since the total welding pressure by a fixing roller and a pressurization roller carrying out a pressure welding becomes small one by one as it \*\*, and record material progresses one by one according to the 3rd invention, it is not necessary to apply the force beyond the need to record material,

therefore generating of Siwa of this record material is suppressed, and the conveyance nature of image formation equipment and improvement in dependability are achieved. Large improvement in dependability of the whole equipment which includes a double-sided multiplex function especially is achieved.

[0027] Moreover, in the first fixing roller pair, since the total welding pressure is large, sufficient pressure for the developer on record material is given, fixable [ high ] is acquired, an offset phenomenon which is generated when fixable is low does not occur, and does not have adhesion of a developer in a fixing roller, and the separability of record material and a fixing roller becomes good as the result.

[0028] That is, while preventing generating of an offset phenomenon, and securing fixable and obtaining the stable high definition since fixable [ high ] is securable by the first fixing roller pair even if the following total welding pressure of a fixing roller pair is small if the total welding pressure of extent which does not generate an offset phenomenon remarkably is given in the first fixing roller pair, a raise in the life of the cleaning means of a fixing roller and easy-ization of a service maintenance also become possible.

[0029]

[Example]

The example of the 1st invention is explained below to [the 1st invention] based on an accompanying drawing.

[0030] Drawing 1 is the sectional view of the anchorage device 1 of the image formation equipment concerning this invention, and this anchorage device 1 has the pressurization roller 3 arranged by carrying out a pressure welding so that the nip of the fixing roller 2 which rotates in the direction of illustration arrow-head A, and this fixing roller 2 might be formed. In addition, the fixing roller 2 is supported free [ rotation ] by non-illustrated bearing.

[0031] It consists of metallic materials of aluminum or an iron system, and, for the thickness of the rodding,  $t_1$  and an outer diameter are [ the above-mentioned fixing roller 2 ]  $\phi D1$ . It is set up, respectively. And in order to prevent adhesion of a toner, coating of the front face of this fixing roller 2 is carried out by fluorine system resin, such as Teflon (trademark).

[0032] On the other hand, said pressurization roller 3 consists of rodding section 3a and rubber section 3b, the outer diameter is  $\phi D1'$  and the  $t_1'$  degree of hardness is set as  $Hs1$  for the thickness of rubber section 3b, respectively. And this pressurization roller 3 is projection 1a and the spring force  $p_1$  which it is supported free [ rotation ] through non-illustrated bearing by the pressurization arm 5 which rotates a revolving shaft 4 as a core, and the other end of this pressurization arm 5 engaged with the screw 6, and were formed in a part of frame 1' of an anchorage device 1. It is energized with the pressurization spring 7 which it had. Therefore, in the pressurization roller 3, it is the total welding pressure  $P_1$ . It is given, the pressure welding of this pressurization roller 3 is carried out to a fixing roller 2, and it is width of face  $T_1$  between fixing rollers 2. Nip is formed.

[0033] Moreover, the separation pawls 8 and 9 are formed in the fixing roller 2 and the pressurization roller 3, respectively, springs 10 and 11 are engaging with one edges 8a and 9a each of these separation pawls 8 and 9, respectively, the other end of each springs 10 and 11 is engaging with the fixed end 1b and 1c in an anchorage device 1, and the separation pawls 8 and 9 are in contact with the fixing roller 2 and the pressurization roller 3 by place constant pressure with this, respectively.

[0034] It \*\* and paper 12 is conveyed by the non-illustrated conveyance section from the right-hand side of drawing 1 in this anchorage device 1 to left-hand side. In addition, the non-established developer image 13 is formed on paper 12.

[0035] And the pressurization roller 15 and the fixing roller 16 are arranged in left-hand side by the anchorage device 1 along the conveyance direction of the above-mentioned paper 12. A rotation drive is carried out in the direction of illustration arrow-head B, a fixing roller 16 carries out the pressure welding of the pressurization roller 15 to this pressurization roller 15, and nip is formed among both. Here, the fixing roller 16 is supported by non-illustrated bearing free [ rotation ].

[0036] The above-mentioned pressurization roller 15 consists of cylinder-like rodding section 15a and rubber section 15b, and  $t_2'$  and a rubber degree of hardness are set [ the outer diameter ] as  $Hs2$  for the

thickness of  $\phi D_2'$  and rubber section 15b, respectively. and this pressurization roller 15 supports a revolving shaft 17 free [ rotation ] through non-illustrated bearing on the pressurization arm 18 rotated as a core -- having -- \*\*\*\* -- the other end of this pressurization arm 18 -- a screw 19 -- being engaged -- frame 1' of an anchorage device 1 -- a part of 1d of projections and spring force  $p_2$  It is energized with the pressurization spring 20 which it had. Therefore, in the pressurization roller 15, it is the total welding pressure  $P_2$ . It is given, the pressure welding of this pressurization roller 15 is carried out to a fixing roller 16, and it is width of face T2 between fixing rollers 16. Nip is formed.

[0037] On the other hand, it is constituted like said fixing roller 2, and consists of metallic materials of aluminum or an iron system, and, for the thickness of the rodding,  $t_2$  and an outer diameter are [ a fixing roller 16 ]  $\phi D_2$ . It is set up.

[0038] Moreover, the separation pawls 21 and 22 are formed in the pressurization roller 15 and the fixing roller 16, respectively, springs 23 and 24 are engaging with one edges 21a and 22a each of the separation pawls 21 and 22, respectively, the other end of each spring 23 and 24 is engaging with the fixed end 1e and 1f in an anchorage device 1, and each separation pawls 21 and 22 are in contact with the pressurization roller 15 and the fixing roller 16 by place constant pressure with this, respectively.

[0039] Furthermore, the halogen heaters 25 and 26 prolonged in the longitudinal direction are arranged in the interior of a fixing roller 2 and a fixing roller 16, respectively, and halogen heaters 25 and 26 are W1 and W2, respectively. It has WATTEJ, the heat generated in them acts on the non-established developer image 13 on the paper 12 which runs in the direction of illustration arrow-head C through fixing rollers 2 and 16, and it is fixed to the developer image 13 on paper 12.

[0040] Moreover, the web 27 which carried out oil impregnation of the oil of the specified quantity is in contact with the fixing roller 2 and the fixing roller 16 through the web rollers 28 and 29, and the residual developer on the front face of fixing rollers 2 and 16 is removed by the web 27. A web 27 is sent out more quantitatively than supply side 27a, and is rolled round by rolling-up side 27b in the direction of an illustration D arrow head, and generating of offset is prevented by this web 27.

[0041] Furthermore, in order to control the temperature on each front face to the fixing roller 2 and fixing roller 16 in which halogen heaters 25 and 26 are formed, the thermistors 30 and 31 which are temperature detectors are made to contact fixing rollers 2 and 16 by place constant pressure.

[0042] On the other hand, the inlet-port guide 32 for carrying out guidance conveyance is attached in frame 1' of an anchorage device 1 on the screw 33 in paper 12 to the fixing roller 2 side, and generating of Siwa of the paper 12 by the right-hand side fixing roller pair (a fixing roller 2 and pressurization roller 3) is prevented to it by making paper 12 contact and advance to a fixing roller 2 side.

[0043] By the way, although a total of two pairs of fixing roller pairs of a fixing roller pair which consist of the fixing roller pair and the pressurization roller 15 which consist of a fixing roller 2 and a pressurization roller 3, and a fixing roller 16 in the anchorage device 1 concerning this example is arranged diameter  $\phi D_1$  of the fixing rollers 2 and 16 of each fixing roller pair, and  $\phi D_2$  it becomes small along the conveyance direction (left of drawing 1 ) of paper 12 ( $\phi D_2 < \phi D_1$ ) -- it is constituted like. Specifically, they are diameter  $\phi D_1$  of fixing rollers 2 and 16, and  $\phi D_2$ . It is set as  $\phi D_1 = \phi 40\text{mm}$  and  $\phi D_2 = \phi 30\text{mm}$ , respectively.

[0044] Generally, the diameter (curvature) of a fixing roller is participating in one of the causes of conveyance jam generating of the record material established in the heat roller fixing method greatly, and with a fixing roller with small curvature with a large diameter, since curvature separation of record material cannot be performed easily, it becomes the inclination for record material to coil around this fixing roller. For this reason, a separation pawl needs to separate record material, therefore it becomes easy to generate a separation jam.

[0045] On the contrary, since it can tend to perform curvature separation of record material in a fixing roller with big curvature with a small diameter, record material does not coil around a fixing roller, but the separability of this record material is good.

[0046] according to [ \*\* and ] this example -- diameter diameter  $\phi D_1$  of the fixing rollers 2 and 16 of a fixing roller pair, and  $\phi D_2$  Since [ which becomes small along the conveyance direction (left of drawing 1 ) of paper 12 ( $\phi D_2 < \phi D_1$ ) ] it is constituted like When the paper 12 which received fixing

of the 1st time curls and then it passes through between the pressurization roller 15 and fixing rollers 16 with a fixing roller 2 and the pressurization roller 3, Although this paper 12 has curled, it dissociates and this paper 12 is conveyed without carrying out a jam, the separability and conveyance nature of this paper 12 are raised, and improvement in dependability of image formation equipment is achieved.

[0047] Moreover, two pairs of fixing roller pairs are arranged by the compact in one in frame 1' of fixing assembly equipment 1, and since each fixing roller pair consists of fixing rollers 2 and 16 of a minor diameter conventionally, it can realize miniaturization of an anchorage device 1 as a result miniaturization of image formation equipment, easy-ization of a maintenance, etc.

[0048] Here, image formation equipment equipped with an anchorage device 1 is explained based on drawing 2 . In addition, drawing 2 is the block diagram of an image formation equipment important section.

[0049] In drawing 2 , 100 is a photoconductor drum which is the cylinder-like latent-image support which rotates in the direction of arrow-head J, and the primary electrification machine 101 is arranged above this photoconductor drum 100.

[0050] It \*\* and the front face of a photoconductor drum 100 is uniformly charged with the primary electrification vessel 101, this front face is exposed by the exposure beam 102, and an electrostatic latent image is formed on the front face of a photoconductor drum 100. And this electrostatic latent image is developed by either or the both sides of the developer 103,104 by which sequential arrangement was carried out as a toner image in the hand of cut of a photoconductor drum 100. In addition, since the nonmagnetic chromatic color toner is contained by one developer 103 and the magnetic black toner is contained by the developer 104 of another side, a multicolor copy is possible.

[0051] The above-mentioned toner image arrives at the imprint section on which the imprint electrification machine 105 of the lower part of this photoconductor drum 100 was arranged with rotation of a photoconductor drum 100. the imprint section -- or [ any of cassettes C1 and C2 ] -- from -- the record material 12 taken out alternatively -- the conveyance way 106 -- passing -- going on -- this record material 12 -- a resist roller pair -- it is controlled by 107, and the toner image and timing on a photoconductor drum 100 are doubled, it is conveyed, and a toner image is imprinted with the imprint electrification vessel 105 on this record material 12.

[0052] Next, with the separation electrification vessel 108 arranged together with said imprint electrification machine 105, the charge given to the record material 12 at the time of an imprint is discharged, and it dissociates from a photoconductor drum 100, and the record material 12 is conveyed by the anchorage device 1, and receives fixing of a toner image here.

[0053] What is necessary is to set a flapper F1 as the location shown in drawing 2 as a continuous line, to convey the record material 12 in the direction of arrow-head E as it is, and just to discharge outside the plane, in performing an one side copy in these above image formation equipments.

[0054] On the other hand, in case both sides or a multiplex copy is performed, it is set as the location which shows a flapper F1 to drawing 2 with a two-dot chain line, and the record material 12 which came out of the anchorage device 1 is conveyed in the direction of arrow-head G. And it is made sense to which the record material 12 from the this middle tray 111 once setting it as the location where a flapper F2 is further shown in drawing 2 as a continuous line in a double-sided copy and containing this record material 12 to Trey Nakama 111 is taken out, this is conveyed along with an arrow head H, and the second page counters a photoconductor drum 100 in this record material 12, and the conveyance way 106 is supplied again. The toner image currently formed in the photoconductor drum 100 by this time is imprinted on the record material 12 by the same technique as the above, it switches to the location which will show a flapper F1 to drawing 2 as a continuous line by the time this record material 12 passes an anchorage device 1, the record material 12 which fixing ended is conveyed in the direction of illustration arrow-head E, and it discharges outside the plane.

[0055] Moreover, what is necessary is to advance the record material 12 which sets a flapper F2 as drawing 2 in the location shown with a two-dot chain line, and advances a multiplex copy in the direction of arrow-head G after the first-page copy termination in being \*\*\*\* in the direction of illustration arrow-head H as it is, to supply this to the conveyance way 106, and just to perform image

formation actuation of the 2nd henceforth like the above on one side of the record material 12.

The example of the 2nd invention is explained below to [the 2nd invention] based on an accompanying drawing.

[0056] Drawing 3 is the sectional view of the anchorage device 1 concerning the 2nd invention, and this anchorage device 1 has the same configuration fundamentally with the anchorage device 1 concerning the 1st invention shown in drawing 1. Therefore, only a different point from the anchorage device 1 (refer to drawing 1) applied to the 1st invention here is described.

[0057] In this example, as shown in drawing 4, the fixing roller 2 and the fixing roller 16 are fabricated by the reverse crown configuration, outer-diameter  $\phi D1b$  of the both ends of one fixing roller 2 is set as  $\phi 40\text{mm}$ , and it is the amount  $a1$  of reverse crown of this fixing roller 2 about the difference of outer-diameter  $\phi D1b$  of these both ends, and outer-diameter  $\phi D1a$  of a center section. If a definition is given, it is  $a1 = \phi D1b - \phi D1a = 170\text{micro}$ .

[0058] Moreover, it is set as  $\phi 40\text{mm}$  and outer-diameter  $\phi D1b$  of the both ends of the fixing roller 16 of another side is the amount  $a2$  of reverse crown of this fixing roller 16 about the difference of outer-diameter  $\phi D1b$  of these both ends, and outer-diameter  $\phi D2a$  of a center section. If a definition is given, it is  $a2 = \phi D2b - \phi D2a = 125\text{micro}$ .

[0059] therefore -- this example -- the amount  $a1$  of reverse crown of fixing rollers 2 and 16, and  $a2$  it becomes small along the travelling direction of the record material 12 ( $a2 < a1$ ) -- it needs -- it is constituted. For this reason, the dependability of the image formation equipment with which it prevented comparatively big stress's arising in the record material 12 in the first fixing roller pair which consists of a fixing roller 2 and a pressurization roller 3, and Siwa occurring in this record material 12, and it included especially the double-sided multiplex function is raised.

The example of the 3rd invention is explained below to [the 3rd invention] based on an accompanying drawing.

[0060] The image formation equipment concerning <1st example> this example describes only a different point from the anchorage device 1 (refer to drawing 3) which is equipped with the example of said 2nd invention, and the anchorage device which has the same configuration fundamentally, therefore is applied to the example of the 2nd invention here.

[0061] At this example, it is the total welding pressure  $P1$  by the side of a fixing roller 2. Spring force  $p1$  of the pressurization spring 7 It is determined, is set as  $P1 = p1 = 30\text{kg}$ , and is the total welding pressure  $P2$  by the side of a fixing roller 16. Spring force  $p2$  of the pressurization spring 20 It is determined and is set as  $P2 = p2 = 20\text{kg}$ .

[0062] Therefore, it consists of this examples so that the total welding pressure of a fixing roller pair may become small one by one along the travelling direction of record material, and it is the total welding pressure  $P2$  by the side of a fixing roller 16. The total welding pressure  $P1$  by the side of a fixing roller 2 It is set up small ( $P2 < P1$ ).

[0063] By the way, generally the force of a pressurization means or the degree of hardness of a pressurization roller is related to the contact pressure of a fixing roller and a pressurization roller. The welding pressure which will be produced with a fixing roller and a pressurization roller if the degree of hardness of a pressurization roller is high or the force of a pressurization means is large also becomes large. record material should narrow strongly between a fixing roller and a pressurization roller -- it becomes \*\*\*\*\*, the effectiveness which lengthens the record material in the reverse crown configuration of a fixing roller usually established for Siwa generating prevention is controlled, and it becomes easy to generate Siwa in record material. In the case of both sides which pass a fixing roller pair again especially, or multiplex functional actuation, it is remarkable.

[0064] It will be in the condition of having been extended with a pressure and heat at the time of the copy of the 1st side, in case a fixing roller is again passed at the time of the copy of the 2nd side, the effectiveness which lengthens record material fades, and the fiber of the paper which is record material will apply the force beyond the need to record material, and makes record material generate many Siwa rather in the same welding pressure as 1 side.

[0065] It is the total welding pressure  $P1$  and  $P2$  as it \*\*, and record material progresses one by one

according to this example. Since it becomes small one by one ( $P1 > P2$ ), it is not necessary to apply the force beyond the need to record material, therefore generating of Siwa of this record material is suppressed, and the conveyance nature of image formation equipment and improvement in dependability are achieved. Large improvement in dependability of the whole equipment which includes a double-sided multiplex function especially is achieved.

[0066] Moreover, at the fixing roller pair of the beginning by the side of a fixing roller 2, it is the total welding pressure  $P1$ . Since it is large, sufficient pressure for the developer on record material is given, fixable [ high ] is acquired, an offset phenomenon which is generated when fixable is low does not occur, and does not have adhesion of a developer in a fixing roller 2, and the separability of record material and a fixing roller 2 becomes good as the result.

[0067] That is, the total welding pressure  $P1$  of extent which does not generate an offset phenomenon remarkably in the first fixing roller pair If it gives The following total welding pressure  $P2$  of a fixing roller pair While preventing generating of an offset phenomenon, and securing fixable and obtaining the stable high definition since fixable [ high ] is securable by the first fixing roller pair even if small A raise in the life of the cleaning means of fixing rollers 2 and 16 and easy-ization of a service maintenance also become possible.

[0068] In <2nd example> this example, only the degrees of hardness  $Hs1$  and  $Hs2$  of a difference and others of the rubber sections 3b and 15b of the pressurization rollers 3 and 15 are the same as that of said 1st example.

[0069] Generally, it is known that the total welding pressure will also become large in proportion to the magnitude of a rubber degree of hardness.

[0070] The total welding pressure  $P1$  in the fixing roller pair by the side of a fixing roller 2 in this example It is determined by the degree of hardness  $Hs1$  of rubber section 3b of the pressurization roller 3, and is  $1 = 50$  degree of  $Hs(es)$ . the total pressurization  $P2$  of a fixing roller pair by the side of a fixing roller 16 Since it is the degree of hardness  $Hs$  of  $2 = 40$  degrees ( $<Hs1$ ) of rubber section 15b of the pressurization roller 15, it is the total welding pressure  $P2$  by the side of a fixing roller 16 like said 1st example. The total welding pressure  $P1$  by the side of a fixing roller 2 It is set up small ( $P2 < P1$ ).

[0071] The 3rd example of <3rd example> this invention is explained based on drawing 5.

[0072] this example -- \*\*\*\* -- drawing 5 -- being shown -- as -- pressurization -- a roller -- three -- pressurization -- a roller -- 15 -- each -- rubber -- the section -- three -- b -- 15 -- b -- thickness --  $t$  -- one -- ' --  $t$  -- two -- ' -- only -- a difference and others -- the 1st example -- being the same.

[0073] It is known that an apparent rubber degree of hardness will become small in proportion to the thick magnitude of rubber, and the total welding pressure will generally also become small as a result.

[0074] The total welding pressure  $P1$  in the fixing roller pair by the side of a fixing roller 2 in this example The rubber degree of hardness of the appearance of the pressurization roller 3, That is, thickness  $t1'$  of rubber section 3b is determined, and it is set as  $t1' = 5\text{mm}$ . The total welding pressure  $P2$  in the fixing roller pair by the side of a fixing roller 16 Since the rubber degree of hardness of the appearance of the pressurization roller 15, i.e., thickness  $t2'$  of rubber section 15b, is determined and it is set as  $t2' = 7\text{mm}$  ( $> t1$ ), It is the total welding pressure  $P2$  by the side of a fixing roller 16 like said 1st example. The total welding pressure  $P1$  by the side of a fixing roller 2 It is set up small ( $P2 < P1$ ).

[0075] The 4th example of <4th example> this invention is explained based on drawing 6.

[0076] The width of face  $T1$  of the nip produced in this example with the pressure welding of a fixing roller 2, the pressurization roller 3 and a fixing roller 16, and the pressurization roller 15, and  $T2$  It is accepted and a difference and others are the same as that of the 1st example.

[0077] If nip width of face is generally small, it is known that the total welding pressure will also become small in proportion to this.

[0078] The total welding pressure  $P1$  in the fixing roller pair by the side of a fixing roller 2 in this example Nip width of face  $T1$  It is determined and is set as  $T1 = 3\text{mm}$ . The total welding pressure  $P2$  in the fixing roller pair by the side of a fixing roller 16 Nip width of face  $T2$  Since it is determined and is set as  $T2 = 5\text{mm}$  ( $> T1$ ), It is the total welding pressure  $P2$  by the side of a fixing roller 16 like said 1st example. The total welding pressure  $P1$  by the side of a fixing roller 2 It is set up small ( $P2 < P1$ ).

[0079]

[Effect of the Invention] Since the diameter of the fixing roller of a fixing roller pair becomes small one by one by the above explanation in the travelling direction of record material according to the 1st invention so that clearly (curvature becomes large one by one), Although this record material has curled in case the record material which received fixing of the 1st time curls and a fixing roller pair is passed again, it dissociates, this record material is conveyed without carrying out a jam, and the effectiveness that the separability and conveyance nature of this record material are raised, and improvement in dependability of image formation equipment is achieved is acquired.

[0080] Moreover, since according to the 2nd invention it is constituted so that the amount of reverse crown of a fixing roller may become small one by one along the travelling direction of record material, the effectiveness that the dependability of the image formation equipment with which it prevented comparatively big stress's arising in record material in the first fixing roller pair, and Siwa occurring in this record material, and it included especially the double-sided multiplex function is raised is acquired.

[0081] Furthermore, since according to the 3rd invention the total welding pressure by a fixing roller and a pressurization roller carrying out a pressure welding becomes small one by one as record material progresses one by one, it is not necessary to apply the force beyond the need to record material, therefore generating of Siwa of this record material is suppressed, and the effectiveness that the conveyance nature of image formation equipment and improvement in dependability are achieved is acquired.

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[Translation done.]



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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to image formation equipments, such as a copying machine, facsimile, and a laser beam printer.

[0002]

[Description of the Prior Art] Conventionally, with the image formation equipment which takes an electrophotography method, many heat fixing methods are used as a fixing method to the record material of a non-established developer.

[0003] The use number of sheets of a copy increases with the spread of copying machines, in addition, the copying machine with a quick copy process speed (copy speed) is required by the so-called progress of office laborsaving and OA(office automation)-izing of automation, and the above ultra high-speed machine has come [ by the way, / in recent years ] to spread by above high-speed machine and 100 more sheet/by copy-speed 50 sheet/especially.

[0004]

[Problem(s) to be Solved by the Invention] However, in order for the thickness and path to become large since fixable reservation is required of the heat fixing assembly in the above-mentioned high-speed machine or a ultra high-speed machine, and for heat capacity to also become large and to give still more sufficient heat energy for the fixing roller, the halogen heater of big WATTEJI was required for the fixing roller, wait time became long, the power consumption of equipment became large, and also it had the problem of also enlarging equipment.

[0005] And when image formation equipment was enlarged, the maintenance was complicated, it became still more difficult to secure [ of an installation tooth space or a maintenance tooth space ], it was small and a proposal of the easy high-speed machine of a maintenance and a ultra high-speed machine was desired.

[0006] Wait time is unnecessary and useless time amount especially for a user, and did not spoil fixable in the high-speed machine or the ultra high-speed machine, and an appearance of the secure-closing equipment which can shorten wait time was desired strongly.

[0007] Moreover, the function of a copying machine has multi-functionalized and many functions of a double-sided copy or a multiplex copy have been used by progress of automation in recent years. The high-speed machine and the ultra high-speed machine are standardly equipped with this double-sided multiplex function, and while a copy speed is a part for 20-40-sheet/, it is equipped by a standard equipment or option correspondence also with the low-speed machine. After carrying out image formation to record material, the stack of this record material is once carried out to Trey Nakama, and the process fixed to the rear face or the same field of that record material by carrying out image formation again is included in this both sides and multiplex copy actuation.

[0008] By the way, by the conventional heat fixing method, curl surely occurs in record material with heat and welding pressure. The curl direction and the amount of curl of the record material have large variation in an environment, a paper type or size, etc. In case Trey Nakama is made to do the receipt

stack of the record material, this record material can be round by curl, and cannot contain, or It was in the middle of conveyance, and the jam might be carried out, the re-imprint might occur under the effect of curl in the case of re-feeding at the time of the image formation of the 2nd side, or the imprint omission might occur [, and ], and image quality might deteriorate. [ that a point breaks ]

[0009] Moreover, also when the record material which passed the fixing assembly was discharged outside the plane and contained by a sorter, a finisher, the tray, etc., poor receipt, a jam, etc. of this record material might be generated by curl.

[0010] As mentioned above, it was not easy to fully satisfy a double-sided multiplex function, for this reason, the curl prevention means of former versatility etc. was devised, but it could not say that all were enough but an appearance of the equipment which equipped the double-sided multiplex function that dependability with little curl is high was desired strongly.

[0011] Furthermore, recently, it becomes possible from the position of the ecology of earth environmental protection to begin to use recycled paper as copy paper for reservation of forest resources, in addition to reduce copy paper as much as possible on the front reverse side of paper, by the previous double-sided multiplex function, since image formation is possible, and many the double-sided copies and multiplex copies which use recycled paper are used increasingly.

[0012] however , it have the fault which be large by heat [ in / since the directivity of fiber be uniform / the usual copy paper / whenever / orientation angle / which , as for a recycled paper , the paper fiber receive a damage by that down stream processing how many times , and the waist ( rigidity ) of paper be weak , and show the variation condition in the direction of the clearance eye of paper fiber further / be large , and / a heat fixing method ] , and welding pressure , and be remarkably inferior in conveyance nature . [ of the amount of curl ] In addition, in the image formation equipment which has equipped the double-sided multiplex function, various faults resulting from the curl explained previously became more remarkable, and an appearance of the image formation equipment which raised the latitude of the dependability over the record material of many reliance including recycled paper etc. was desired strongly.

[0013] Therefore, the place made into the purpose of the 1st invention is to offer image formation equipment with the high dependability which can plan the conveyance disposition top of record material.

[0014] Moreover, the place made into the purpose of the 2nd invention aims at generating prevention of Siwa of record material, and is to offer the image formation equipment which can raise dependability including a double-sided multiplex function.

[0015] Furthermore, the place made into the purpose of the 3rd invention is to offer image formation equipment with the high dependability which can aim at improvement in the separability of record material, generating prevention of Siwa, generating prevention of an offset phenomenon, etc.

[0016]

[Means for Solving the Problem] Between the fixing roller pairs which consist of the fixing roller which carried out the pressure welding of the 1st invention mutually, and was arranged free [ rotation ] that the above-mentioned purpose should be attained, and a pressurization roller In image formation equipment equipped with the anchorage device established through the record material which supports a non-established developer image Two or more pairs of said fixing roller pair are arranged along the direction where said record material advances, and it is characterized [ the ] by constituting so that the diameter of the fixing roller of this fixing roller pair may become small one by one along the travelling direction of record material.

[0017] Moreover, between the fixing roller pairs which consist of the fixing roller which carried out the pressure welding of the 2nd invention mutually, and was arranged free [ rotation ], and a pressurization roller In image formation equipment equipped with the anchorage device established through the record material which supports a non-established developer image Two or more pairs of said fixing roller pair are arranged along the direction where said record material advances, and it is characterized [ the ] by constituting so that the amount of reverse crown of the fixing roller of this fixing roller pair may become small one by one along the travelling direction of record material.

[0018] Furthermore, between the fixing roller pairs which consist of the fixing roller which carried out the pressure welding of the 3rd invention mutually, and was arranged free [ rotation ], and a pressurization roller In image formation equipment equipped with the anchorage device established through the record material which supports a non-established developer image Two or more pairs of said fixing roller pair are arranged along the direction where said record material advances, and it is characterized [ the ] by constituting so that the total welding pressure of this fixing roller pair may become small one by one along the travelling direction of record material.

[0019]

[Function] Generally, the diameter (curvature) of a fixing roller is participating in one of the causes of conveyance jam generating of the record material established in the heat roller fixing method greatly, and with a fixing roller with small curvature with a large diameter, since curvature separation of record material cannot be performed easily, it becomes the inclination for record material to coil around this fixing roller. For this reason, a separation pawl needs to separate record material, therefore it becomes easy to generate a separation jam.

[0020] On the contrary, since it can tend to perform curvature separation of record material in a fixing roller with big curvature with a small diameter, record material does not coil around a fixing roller, but the separability of this record material is good.

[0021] Since it \*\*, and the diameter of the fixing roller of a fixing roller pair becomes small one by one in the travelling direction of record material according to the 1st invention (curvature becomes large one by one), Although this record material has curled in case the record material which received fixing of the 1st time curls and a fixing roller pair is passed again, it dissociates and this record material is conveyed without carrying out a jam, the separability and conveyance nature of this record material are raised, and improvement in dependability of image formation equipment is achieved.

[0022] Moreover, generally, the fixing roller is fabricated by the reverse crown configuration for Siwa generating prevention of record material, and has prevented that make record material produce stress and Siwa occurs in this record material with the amount of reverse crown, and welding pressure with a pressurization roller. In this case, when the amount of reverse crown of a fixing roller is large, generating of the stress to record material becomes large, and it is hard to generate Siwa in record material.

[0023] It \*\*, and since according to the 2nd invention it is constituted so that the amount of reverse crown of a fixing roller may become small one by one along the travelling direction of record material, the dependability of the image formation equipment with which it prevented comparatively big stress's arising in record material in the first fixing roller pair, and Siwa occurring in this record material, and it included especially the double-sided multiplex function is raised.

[0024] Furthermore, generally the force of a pressurization means or the degree of hardness of a pressurization roller is related to the contact pressure of a fixing roller and a pressurization roller. The welding pressure which will be produced with a fixing roller and a pressurization roller if the degree of hardness of a pressurization roller is high or the force of a pressurization means is large also becomes large. record material should narrow strongly between a fixing roller and a pressurization roller -- it becomes \*\*\*\*\*, the effectiveness which lengthens the record material in the reverse crown configuration of a fixing roller usually established for Siwa generating prevention is controlled, and it becomes easy to generate Siwa in record material. In the case of both sides which pass a fixing roller pair again especially, or multiplex functional actuation, it is remarkable.

[0025] It will be in the condition of having been extended with a pressure and heat at the time of the copy of the 1st side, in case a fixing roller is again passed at the time of the copy of the 2nd side, the effectiveness which lengthens record material fades, and the fiber of the paper which is record material will apply the force beyond the need to record material, and makes record material generate many Siwa rather in the same welding pressure as 1 side.

[0026] Since the total welding pressure by a fixing roller and a pressurization roller carrying out a pressure welding becomes small one by one as it \*\*, and record material progresses one by one according to the 3rd invention, it is not necessary to apply the force beyond the need to record material,

therefore generating of Siwa of this record material is suppressed, and the conveyance nature of image formation equipment and improvement in dependability are achieved. Large improvement in dependability of the whole equipment which includes a double-sided multiplex function especially is achieved.

[0027] Moreover, in the first fixing roller pair, since the total welding pressure is large, sufficient pressure for the developer on record material is given, fixable [ high ] is acquired, an offset phenomenon which is generated when fixable is low does not occur, and does not have adhesion of a developer in a fixing roller, and the separability of record material and a fixing roller becomes good as the result.

[0028] That is, while preventing generating of an offset phenomenon, and securing fixable and obtaining the stable high definition since fixable [ high ] is securable by the first fixing roller pair even if the following total welding pressure of a fixing roller pair is small if the total welding pressure of extent which does not generate an offset phenomenon remarkably is given in the first fixing roller pair, a raise in the life of the cleaning means of a fixing roller and easy-ization of a service maintenance also become possible.

[0029]

[Example]

The example of the 1st invention is explained below to [the 1st invention] based on an accompanying drawing.

[0030] Drawing 1 is the sectional view of the anchorage device 1 of the image formation equipment concerning this invention, and this anchorage device 1 has the pressurization roller 3 arranged by carrying out a pressure welding so that the nip of the fixing roller 2 which rotates in the direction of illustration arrow-head A, and this fixing roller 2 might be formed. In addition, the fixing roller 2 is supported free [ rotation ] by non-illustrated bearing.

[0031] It consists of metallic materials of aluminum or an iron system, and, for the thickness of the rodding,  $t_1$  and an outer diameter are [ the above-mentioned fixing roller 2 ]  $\phi D_1$ . It is set up, respectively. And in order to prevent adhesion of a toner, coating of the front face of this fixing roller 2 is carried out by fluorine system resin, such as Teflon (trademark).

[0032] On the other hand, said pressurization roller 3 consists of rodding section 3a and rubber section 3b, the outer diameter is  $\phi D_1'$  and the  $t_1'$  degree of hardness is set as  $Hs_1$  for the thickness of rubber section 3b, respectively. And this pressurization roller 3 is projection 1a and the spring force  $p_1$  which it is supported free [ rotation ] through non-illustrated bearing by the pressurization arm 5 which rotates a revolving shaft 4 as a core, and the other end of this pressurization arm 5 engaged with the screw 6, and were formed in a part of frame 1' of an anchorage device 1. It is energized with the pressurization spring 7 which it had. Therefore, in the pressurization roller 3, it is the total welding pressure  $P_1$ . It is given, the pressure welding of this pressurization roller 3 is carried out to a fixing roller 2, and it is width of face  $T_1$  between fixing rollers 2. Nip is formed.

[0033] Moreover, the separation pawls 8 and 9 are formed in the fixing roller 2 and the pressurization roller 3, respectively, springs 10 and 11 are engaging with one edges 8a and 9a each of these separation pawls 8 and 9, respectively, the other end of each springs 10 and 11 is engaging with the fixed end 1b and 1c in an anchorage device 1, and the separation pawls 8 and 9 are in contact with the fixing roller 2 and the pressurization roller 3 by place constant pressure with this, respectively.

[0034] It \*\* and paper 12 is conveyed by the non-illustrated conveyance section from the right-hand side of drawing 1 in this anchorage device 1 to left-hand side. In addition, the non-established developer image 13 is formed on paper 12.

[0035] And the pressurization roller 15 and the fixing roller 16 are arranged in left-hand side by the anchorage device 1 along the conveyance direction of the above-mentioned paper 12. A rotation drive is carried out in the direction of illustration arrow-head B, a fixing roller 16 carries out the pressure welding of the pressurization roller 15 to this pressurization roller 15, and nip is formed among both. Here, the fixing roller 16 is supported by non-illustrated bearing free [ rotation ].

[0036] The above-mentioned pressurization roller 15 consists of cylinder-like rodding section 15a and rubber section 15b, and  $t_2'$  and a rubber degree of hardness are set [ the outer diameter ] as  $Hs_2$  for the

thickness of  $\phi D_2'$  and rubber section 15b, respectively. and this pressurization roller 15 supports a revolving shaft 17 free [ rotation ] through non-illustrated bearing on the pressurization arm 18 rotated as a core -- having -- \*\*\*\* -- the other end of this pressurization arm 18 -- a screw 19 -- being engaged -- frame 1' of an anchorage device 1 -- a part of 1d of projections and spring force p2 It is energized with the pressurization spring 20 which it had. Therefore, in the pressurization roller 15, it is the total welding pressure P2. It is given, the pressure welding of this pressurization roller 15 is carried out to a fixing roller 16, and it is width of face T2 between fixing rollers 16. Nip is formed.

[0037] On the other hand, it is constituted like said fixing roller 2, and consists of metallic materials of aluminum or an iron system, and, for the thickness of the rodding, t2 and an outer diameter are [ a fixing roller 16 ]  $\phi D_2$ . It is set up.

[0038] Moreover, the separation pawls 21 and 22 are formed in the pressurization roller 15 and the fixing roller 16, respectively, springs 23 and 24 are engaging with one edges 21a and 22a each of the separation pawls 21 and 22, respectively, the other end of each spring 23 and 24 is engaging with the fixed end 1e and 1f in an anchorage device 1, and each separation pawls 21 and 22 are in contact with the pressurization roller 15 and the fixing roller 16 by place constant pressure with this, respectively.

[0039] Furthermore, the halogen heaters 25 and 26 prolonged in the longitudinal direction are arranged in the interior of a fixing roller 2 and a fixing roller 16, respectively, and halogen heaters 25 and 26 are W1 and W2, respectively. It has WATTEJ, the heat generated in them acts on the non-established developer image 13 on the paper 12 which runs in the direction of illustration arrow-head C through fixing rollers 2 and 16, and it is fixed to the developer image 13 on paper 12.

[0040] Moreover, the web 27 which carried out oil impregnation of the oil of the specified quantity is in contact with the fixing roller 2 and the fixing roller 16 through the web rollers 28 and 29, and the residual developer on the front face of fixing rollers 2 and 16 is removed by the web 27. A web 27 is sent out more quantitatively than supply side 27a, and is rolled round by rolling-up side 27b in the direction of an illustration D arrow head, and generating of offset is prevented by this web 27.

[0041] Furthermore, in order to control the temperature on each front face to the fixing roller 2 and fixing roller 16 in which halogen heaters 25 and 26 are formed, the thermistors 30 and 31 which are temperature detectors are made to contact fixing rollers 2 and 16 by place constant pressure.

[0042] On the other hand, the inlet-port guide 32 for carrying out guidance conveyance is attached in frame 1' of an anchorage device 1 on the screw 33 in paper 12 to the fixing roller 2 side, and generating of Siwa of the paper 12 by the right-hand side fixing roller pair (a fixing roller 2 and pressurization roller 3) is prevented to it by making paper 12 contact and advance to a fixing roller 2 side.

[0043] By the way, although a total of two pairs of fixing roller pairs of a fixing roller pair which consist of the fixing roller pair and the pressurization roller 15 which consist of a fixing roller 2 and a pressurization roller 3, and a fixing roller 16 in the anchorage device 1 concerning this example is arranged diameter  $\phi D_1$  of the fixing rollers 2 and 16 of each fixing roller pair, and  $\phi D_2$  it becomes small along the conveyance direction (left of drawing 1 ) of paper 12 ( $\phi D_2 < \phi D_1$ ) -- it is constituted like. Specifically, they are diameter  $\phi D_1$  of fixing rollers 2 and 16, and  $\phi D_2$ . It is set as  $\phi D_1 = \phi 40\text{mm}$  and  $\phi D_2 = \phi 30\text{mm}$ , respectively.

[0044] Generally, the diameter (curvature) of a fixing roller is participating in one of the causes of conveyance jam generating of the record material established in the heat roller fixing method greatly, and with a fixing roller with small curvature with a large diameter, since curvature separation of record material cannot be performed easily, it becomes the inclination for record material to coil around this fixing roller. For this reason, a separation pawl needs to separate record material, therefore it becomes easy to generate a separation jam.

[0045] On the contrary, since it can tend to perform curvature separation of record material in a fixing roller with big curvature with a small diameter, record material does not coil around a fixing roller, but the separability of this record material is good.

[0046] according to [ \*\* and ] this example -- diameter diameter  $\phi D_1$  of the fixing rollers 2 and 16 of a fixing roller pair, and  $\phi D_2$  Since [ which becomes small along the conveyance direction (left of drawing 1 ) of paper 12 ( $\phi D_2 < \phi D_1$ ) ] it is constituted like When the paper 12 which received fixing

of the 1st time curls and then it passes through between the pressurization roller 15 and fixing rollers 16 with a fixing roller 2 and the pressurization roller 3, Although this paper 12 has curled, it dissociates and this paper 12 is conveyed without carrying out a jam, the separability and conveyance nature of this paper 12 are raised, and improvement in dependability of image formation equipment is achieved.

[0047] Moreover, two pairs of fixing roller pairs are arranged by the compact in one in frame 1' of fixing assembly equipment 1, and since each fixing roller pair consists of fixing rollers 2 and 16 of a minor diameter conventionally, it can realize miniaturization of an anchorage device 1 as a result miniaturization of image formation equipment, easy-ization of a maintenance, etc.

[0048] Here, image formation equipment equipped with an anchorage device 1 is explained based on drawing 2 . In addition, drawing 2 is the block diagram of an image formation equipment important section.

[0049] In drawing 2 , 100 is a photoconductor drum which is the cylinder-like latent-image support which rotates in the direction of arrow-head J, and the primary electrification machine 101 is arranged above this photoconductor drum 100.

[0050] It \*\* and the front face of a photoconductor drum 100 is uniformly charged with the primary electrification vessel 101, this front face is exposed by the exposure beam 102, and an electrostatic latent image is formed on the front face of a photoconductor drum 100. And this electrostatic latent image is developed by either or the both sides of the developer 103,104 by which sequential arrangement was carried out as a toner image in the hand of cut of a photoconductor drum 100. In addition, since the nonmagnetic chromatic color toner is contained by one developer 103 and the magnetic black toner is contained by the developer 104 of another side, a multicolor copy is possible.

[0051] The above-mentioned toner image arrives at the imprint section on which the imprint electrification machine 105 of the lower part of this photoconductor drum 100 was arranged with rotation of a photoconductor drum 100. the imprint section -- or [ any of cassettes C1 and C2 ] -- from -- the record material 12 taken out alternatively -- the conveyance way 106 -- passing -- going on -- this record material 12 -- a resist roller pair -- it is controlled by 107, and the toner image and timing on a photoconductor drum 100 are doubled, it is conveyed, and a toner image is imprinted with the imprint electrification vessel 105 on this record material 12.

[0052] Next, with the separation electrification vessel 108 arranged together with said imprint electrification machine 105, the charge given to the record material 12 at the time of an imprint is discharged, and it dissociates from a photoconductor drum 100, and the record material 12 is conveyed by the anchorage device 1, and receives fixing of a toner image here.

[0053] What is necessary is to set a flapper F1 as the location shown in drawing 2 as a continuous line, to convey the record material 12 in the direction of arrow-head E as it is, and just to discharge outside the plane, in performing an one side copy in these above image formation equipments.

[0054] On the other hand, in case both sides or a multiplex copy is performed, it is set as the location which shows a flapper F1 to drawing 2 with a two-dot chain line, and the record material 12 which came out of the anchorage device 1 is conveyed in the direction of arrow-head G. And it is made sense to which the record material 12 from the this middle tray 111 once setting it as the location where a flapper F2 is further shown in drawing 2 as a continuous line in a double-sided copy and containing this record material 12 to Trey Nakama 111 is taken out, this is conveyed along with an arrow head H, and the second page counters a photoconductor drum 100 in this record material 12, and the conveyance way 106 is supplied again. The toner image currently formed in the photoconductor drum 100 by this time is imprinted on the record material 12 by the same technique as the above, it switches to the location which will show a flapper F1 to drawing 2 as a continuous line by the time this record material 12 passes an anchorage device 1, the record material 12 which fixing ended is conveyed in the direction of illustration arrow-head E, and it discharges outside the plane.

[0055] Moreover, what is necessary is to advance the record material 12 which sets a flapper F2 as drawing 2 in the location shown with a two-dot chain line, and advances a multiplex copy in the direction of arrow-head G after the first-page copy termination in being \*\*\*\* in the direction of illustration arrow-head H as it is, to supply this to the conveyance way 106, and just to perform image



formation actuation of the 2nd henceforth like the above on one side of the record material 12.

The example of the 2nd invention is explained below to [the 2nd invention] based on an accompanying drawing.

[0056] Drawing 3 is the sectional view of the anchorage device 1 concerning the 2nd invention, and this anchorage device 1 has the same configuration fundamentally with the anchorage device 1 concerning the 1st invention shown in drawing 1. Therefore, only a different point from the anchorage device 1 (refer to drawing 1) applied to the 1st invention here is described.

[0057] In this example, as shown in drawing 4, the fixing roller 2 and the fixing roller 16 are fabricated by the reverse crown configuration, outer-diameter  $\phi D1b$  of the both ends of one fixing roller 2 is set as  $\phi 40\text{mm}$ , and it is the amount  $a1$  of reverse crown of this fixing roller 2 about the difference of outer-diameter  $\phi D1b$  of these both ends, and outer-diameter  $\phi D1a$  of a center section. If a definition is given, it is  $a1 = \phi D1b - \phi D1a = 170\text{micro}$ .

[0058] Moreover, it is set as  $\phi 40\text{mm}$  and outer-diameter  $\phi D1b$  of the both ends of the fixing roller 16 of another side is the amount  $a2$  of reverse crown of this fixing roller 16 about the difference of outer-diameter  $\phi D1b$  of these both ends, and outer-diameter  $\phi D2a$  of a center section. If a definition is given, it is  $a2 = \phi D2b - \phi D2a = 125\text{micro}$ .

[0059] therefore -- this example -- the amount  $a1$  of reverse crown of fixing rollers 2 and 16, and  $a2$  it becomes small along the travelling direction of the record material 12 ( $a2 < a1$ ) -- it needs -- it is constituted. For this reason, the dependability of the image formation equipment with which it prevented comparatively big stress's arising in the record material 12 in the first fixing roller pair which consists of a fixing roller 2 and a pressurization roller 3, and Siwa occurring in this record material 12, and it included especially the double-sided multiplex function is raised.

The example of the 3rd invention is explained below to [the 3rd invention] based on an accompanying drawing.

[0060] The image formation equipment concerning <1st example> this example describes only a different point from the anchorage device 1 (refer to drawing 3) which is equipped with the example of said 2nd invention, and the anchorage device which has the same configuration fundamentally, therefore is applied to the example of the 2nd invention here.

[0061] At this example, it is the total welding pressure  $P1$  by the side of a fixing roller 2. Spring force  $p1$  of the pressurization spring 7 It is determined, is set as  $P1 = p1 = 30\text{kg}$ , and is the total welding pressure  $P2$  by the side of a fixing roller 16. Spring force  $p2$  of the pressurization spring 20 It is determined and is set as  $P2 = p2 = 20\text{kg}$ .

[0062] Therefore, it consists of this examples so that the total welding pressure of a fixing roller pair may become small one by one along the travelling direction of record material, and it is the total welding pressure  $P2$  by the side of a fixing roller 16. The total welding pressure  $P1$  by the side of a fixing roller 2 It is set up small ( $P2 < P1$ ).

[0063] By the way, generally the force of a pressurization means or the degree of hardness of a pressurization roller is related to the contact pressure of a fixing roller and a pressurization roller. The welding pressure which will be produced with a fixing roller and a pressurization roller if the degree of hardness of a pressurization roller is high or the force of a pressurization means is large also becomes large. record material should narrow strongly between a fixing roller and a pressurization roller -- it becomes \*\*\*\*\*, the effectiveness which lengthens the record material in the reverse crown configuration of a fixing roller usually established for Siwa generating prevention is controlled, and it becomes easy to generate Siwa in record material. In the case of both sides which pass a fixing roller pair again especially, or multiplex functional actuation, it is remarkable.

[0064] It will be in the condition of having been extended with a pressure and heat at the time of the copy of the 1st side, in case a fixing roller is again passed at the time of the copy of the 2nd side, the effectiveness which lengthens record material fades, and the fiber of the paper which is record material will apply the force beyond the need to record material, and makes record material generate many Siwa rather in the same welding pressure as 1 side.

[0065] It is the total welding pressure  $P1$  and  $P2$  as it \*\*, and record material progresses one by one



according to this example. Since it becomes small one by one ( $P1 > P2$ ), it is not necessary to apply the force beyond the need to record material, therefore generating of Siwa of this record material is suppressed, and the conveyance nature of image formation equipment and improvement in dependability are achieved. Large improvement in dependability of the whole equipment which includes a double-sided multiplex function especially is achieved.

[0066] Moreover, at the fixing roller pair of the beginning by the side of a fixing roller 2, it is the total welding pressure  $P1$ . Since it is large, sufficient pressure for the developer on record material is given, fixable [ high ] is acquired, an offset phenomenon which is generated when fixable is low does not occur, and does not have adhesion of a developer in a fixing roller 2, and the separability of record material and a fixing roller 2 becomes good as the result.

[0067] That is, the total welding pressure  $P1$  of extent which does not generate an offset phenomenon remarkably in the first fixing roller pair If it gives The following total welding pressure  $P2$  of a fixing roller pair While preventing generating of an offset phenomenon, and securing fixable and obtaining the stable high definition since fixable [ high ] is securable by the first fixing roller pair even if small A raise in the life of the cleaning means of fixing rollers 2 and 16 and easy-ization of a service maintenance also become possible.

[0068] In <2nd example> this example, only the degrees of hardness  $Hs1$  and  $Hs2$  of a difference and others of the rubber sections 3b and 15b of the pressurization rollers 3 and 15 are the same as that of said 1st example.

[0069] Generally, it is known that the total welding pressure will also become large in proportion to the magnitude of a rubber degree of hardness.

[0070] The total welding pressure  $P1$  in the fixing roller pair by the side of a fixing roller 2 in this example It is determined by the degree of hardness  $Hs1$  of rubber section 3b of the pressurization roller 3, and is  $1=50$  degree of  $Hs(es)$ . the total pressurization  $P2$  of a fixing roller pair by the side of a fixing roller 16 Since it is the degree of hardness  $Hs$  of  $2=40$  degrees ( $<Hs1$ ) of rubber section 15b of the pressurization roller 15, it is the total welding pressure  $P2$  by the side of a fixing roller 16 like said 1st example. The total welding pressure  $P1$  by the side of a fixing roller 2 It is set up small ( $P2 < P1$ ).

[0071] The 3rd example of <3rd example> this invention is explained based on drawing 5.

[0072] this example -- \*\*\*\* -- drawing 5 -- being shown -- as -- pressurization -- a roller -- three -- pressurization -- a roller -- 15 -- each -- rubber -- the section -- three -- b -- 15 -- b -- thickness -- t -- one -- ' -- t -- two -- ' -- only -- a difference and others -- the 1st example -- being the same .

[0073] It is known that an apparent rubber degree of hardness will become small in proportion to the thick magnitude of rubber, and the total welding pressure will generally also become small as a result.

[0074] The total welding pressure  $P1$  in the fixing roller pair by the side of a fixing roller 2 in this example The rubber degree of hardness of the appearance of the pressurization roller 3, That is, thickness  $t1'$  of rubber section 3b is determined, and it is set as  $t1'=5mm$ . The total welding pressure  $P2$  in the fixing roller pair by the side of a fixing roller 16 Since the rubber degree of hardness of the appearance of the pressurization roller 15, i.e., thickness  $t2'$  of rubber section 15b, is determined and it is set as  $t2'=7mm$  ( $> t1$ ), It is the total welding pressure  $P2$  by the side of a fixing roller 16 like said 1st example. The total welding pressure  $P1$  by the side of a fixing roller 2 It is set up small ( $P2 < P1$ ).

[0075] The 4th example of <4th example> this invention is explained based on drawing 6.

[0076] The width of face  $T1$  of the nip produced in this example with the pressure welding of a fixing roller 2, the pressurization roller 3 and a fixing roller 16, and the pressurization roller 15, and  $T2$  It is accepted and a difference and others are the same as that of the 1st example.

[0077] If nip width of face is generally small, it is known that the total welding pressure will also become small in proportion to this.

[0078] The total welding pressure  $P1$  in the fixing roller pair by the side of a fixing roller 2 in this example Nip width of face  $T1$  It is determined and is set as  $T1=3mm$ . The total welding pressure  $P2$  in the fixing roller pair by the side of a fixing roller 16 Nip width of face  $T2$  Since it is determined and is set as  $T2=5mm$  ( $> T1$ ), It is the total welding pressure  $P2$  by the side of a fixing roller 16 like said 1st example. The total welding pressure  $P1$  by the side of a fixing roller 2 It is set up small ( $P2 < P1$ ).

[0079]

[Effect of the Invention] Since the diameter of the fixing roller of a fixing roller pair becomes small one by one by the above explanation in the travelling direction of record material according to the 1st invention so that clearly (curvature becomes large one by one), Although this record material has curled in case the record material which received fixing of the 1st time curls and a fixing roller pair is passed again, it dissociates, this record material is conveyed without carrying out a jam, and the effectiveness that the separability and conveyance nature of this record material are raised, and improvement in dependability of image formation equipment is achieved is acquired.

[0080] Moreover, since according to the 2nd invention it is constituted so that the amount of reverse crown of a fixing roller may become small one by one along the travelling direction of record material, the effectiveness that the dependability of the image formation equipment with which it prevented comparatively big stress's arising in record material in the first fixing roller pair, and Siwa occurring in this record material, and it included especially the double-sided multiplex function is raised is acquired.

[0081] Furthermore, since according to the 3rd invention the total welding pressure by a fixing roller and a pressurization roller carrying out a pressure welding becomes small one by one as record material progresses one by one, it is not necessary to apply the force beyond the need to record material, therefore generating of Siwa of this record material is suppressed, and the effectiveness that the conveyance nature of image formation equipment and improvement in dependability are achieved is acquired.

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[Translation done.]

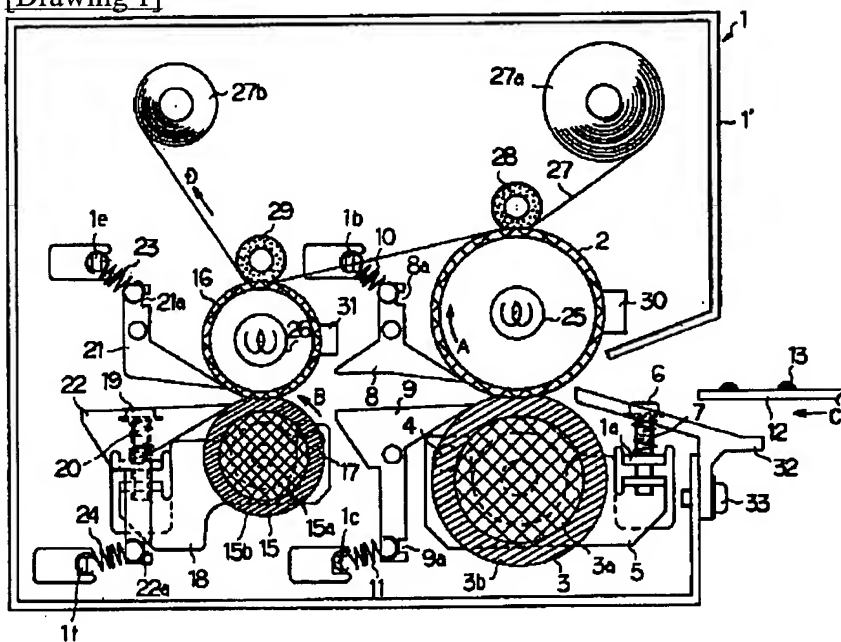
## \* NOTICES \*

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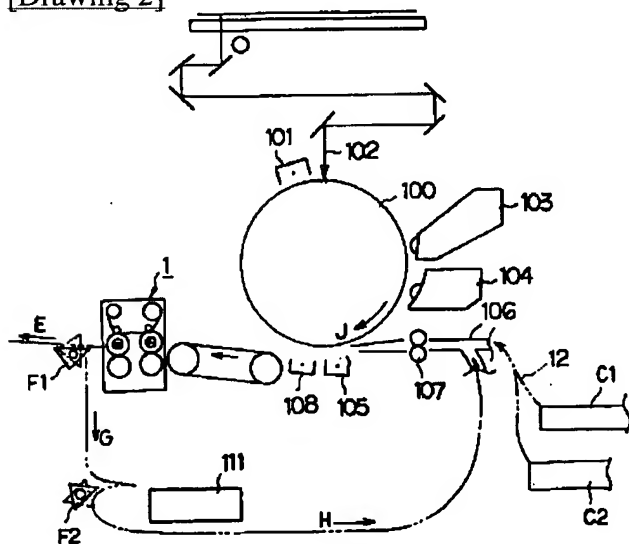
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

## DRAWINGS

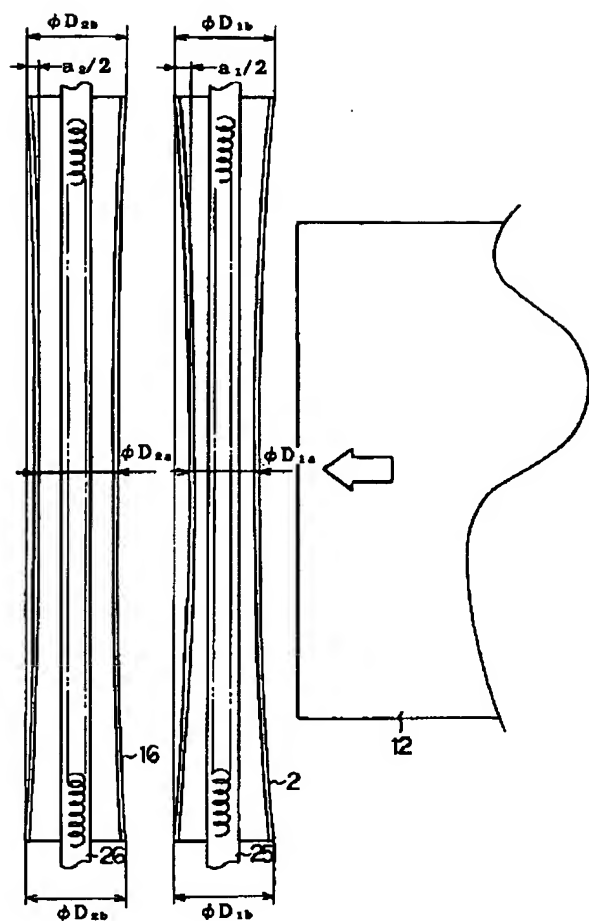
[Drawing 1]



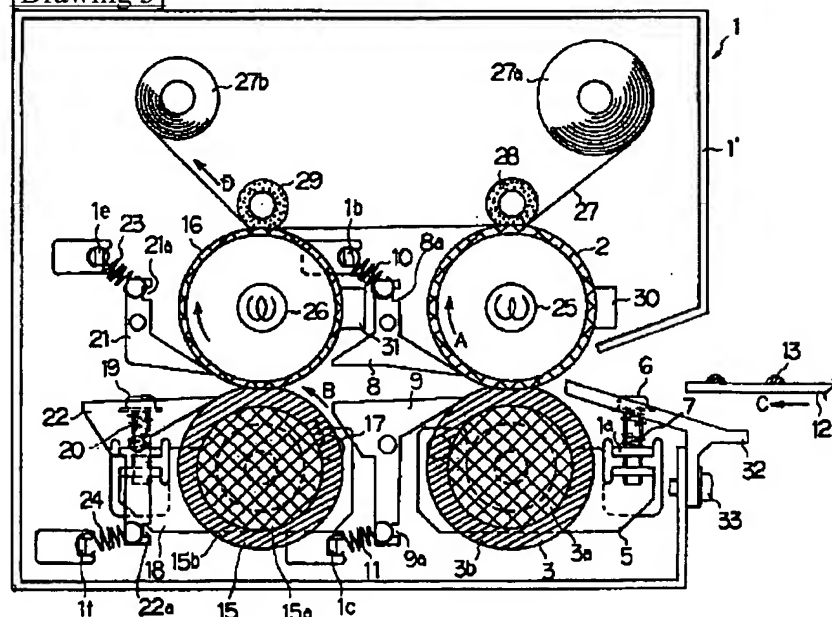
[Drawing 2]



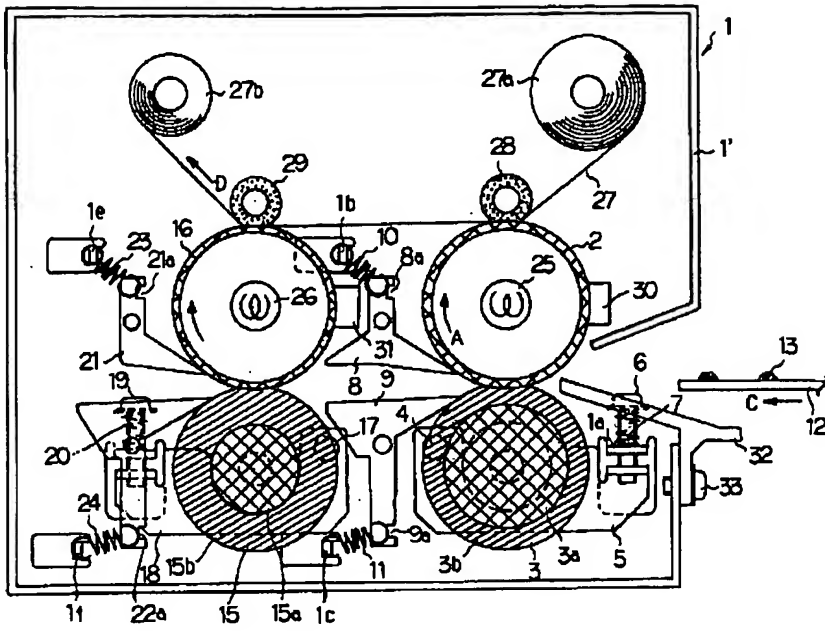
[Drawing 4]



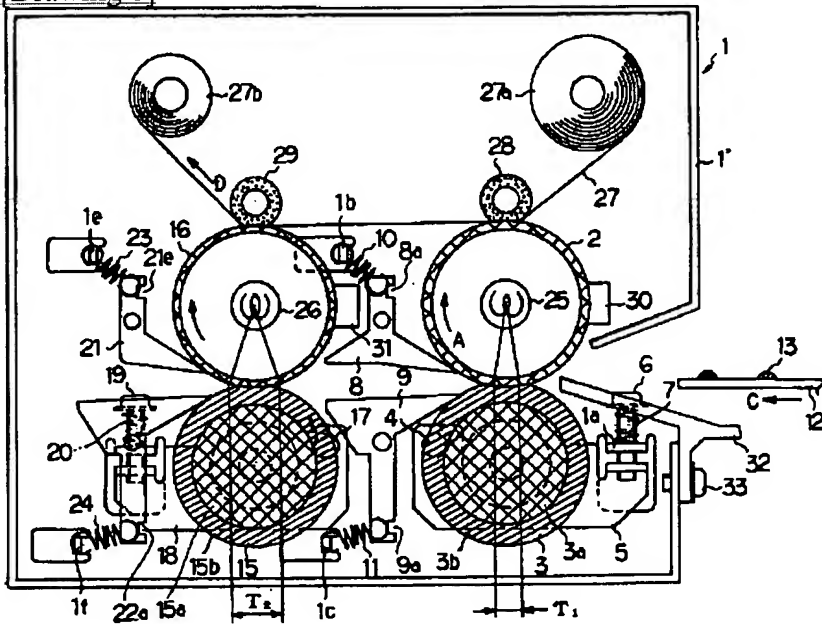
[Drawing 3]



[Drawing 5]



[Drawing 6]



[Translation done.]